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DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES

TED SCHWINDEN, GOVERNOR

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FACT SHEET
EXXON COMPANY, U.S.A. BILLINGS REFINERY
Hazardous Waste Treatment/Storage/Disposal Draft Permit
August 12, 1988

BACKGROUND

In 1976, Congress enacted the Resource Conservation and Recovery Act, also known as RCRA. In 1984, The Solid and Hazardous Waste Bureau of the Montana Department of Health and Environmental Sciences (DHES) was authorized by the EPA to manage the hazardous waste program in Montana. The act gives the DHES and EPA authority to manage hazardous wastes by:

(1) Developing standards to be followed by generators, transporters, and facilities which treat, store, and dispose of hazardous waste;

(2) Allowing enforcement of regulatory standards for such facilities through a permitting process.

In 1980, the Exxon Billings Refinery filed notice with EPA for an "interim status" or temporary permit to treat, store, and dispose of hazardous refinery wastes. The temporary permit required Exxon to inform EPA of the amount and type of hazardous waste generated and processed, to describe and map the facility, and to issue annual updates. Installation of a groundwater monitoring system for treatment and disposal units was also required. Hazardous waste management activities have continued under the temporary permit since then.

In November 1982, EPA requested submittal of a comprehensive permit application, or a "Part B" application, from Exxon. This permit application was submitted by Exxon in September, 1983. Since that time, both EPA and DHES have conducted reviews and deficiency notices of the application. Exxon has responded in turn with revisions, additions, and information from new studies. With the issuance of the draft permit, DHES deems the application to be complete.

The comprehensive draft permit imposes additional requirements on Exxon for hazardous waste operations, monitoring, closure, and reporting. The specific conditions of the draft permit provide greater protection to the public health and environment than the general terms of the temporary permit under which Exxon has been operating.

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Exxon Company U.S.A. Billings Refinery :
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FACILITY DESCRIPTION

The Exxon Billings Refinery processes primarily heavy crude oil and produces an array of fuel products. The refinery has been operating at the Billings location since July 1949, and has a demonstrated processing capacity of 50,000 barrels/day.

The refinery currently produces a variety of hazardous wastes as a result of the refining process. The major wastes by volume are:

- API separator sludge (from the wastewater treatment system)
- slop oil emulsion solids (from the wastewater treatment system)
- sludges from the bottom of crude, intermediate, and product tanks
- acid tar from the alkylation unit

Other hazardous wastes, such as spent solvents, oil contaminated soils, and spent filters are generated in small volumes.

Hazardous wastes generated at the refinery are managed through three separate processes, depending on the type of waste. These are land treatment, weathering of leaded tank bottoms, and container storage.

Land Treatment Units

Land treatment of refinery wastes has been used in the United States since the 1970s. It has been demonstrated to be an effective technology, if it is operated and monitored carefully. Exxon has been land treating wastes since 1980.

The largest volume of hazardous waste generated at Exxon goes to the land treatment units. In the last three years, an average of 1300 tons/year of hazardous waste generated by the wastewater treatment system have been treated in this way. The wastes are comprised mainly of water, oil, and dirt.

Currently, about twenty acres are being used for land treatment. The wastes are spread onto specially maintained cultivated fields, designated as the East and South Land Treatment Units on the attached map. With controlled application rates, tillage, liming, and fertilizer, the oily wastes are broken down biologically. Micro-organisms in the topsoil utilize the organic compounds in the wastes as a food source and break them down in time to carbon dioxide, water, and soil humus. Metals in the wastes are not degraded, but are immobilized within the first foot or two of soil, and do not migrate into deeper soils or into groundwater.

In order to guard against inadvertent contamination of deeper soils or groundwater, the draft permit requires routine sampling of soils, groundwater, and soil-pore water in and around the land treatment units. If contamination is discovered below a five foot depth, or is detected in groundwater, the draft permit requires Exxon to take action to correct the problem and revise operational activities to prevent problems in the future.

When the land treatment units are to be closed, Exxon will be required to treat the soils to maximize degradation, then place topsoil over the units and seed the areas. Groundwater and soils will continue to be monitored, although less frequently, for thirty years after closure.

Lead Weathering Tank

The draft permit allows Exxon to treat sludges from the bottom of leaded gasoline tanks in an open, above-ground tank (see attached map). The tank, constructed in 1983, is placed on an asphalt pad which is underlain by a leak detection system and a PVC liner. The pad allows for detection and containment of spills or leaks from the tank. The treatment process "weathers" or oxidizes the organic lead to a less toxic inorganic form. It also evaporates water from the waste, thereby decreasing its volume. After leaded bottoms are weathered for several months, the residue is removed to drums and shipped out of state to a hazardous waste disposal facility.

Leaded tank bottoms are generated infrequently, only when Exxon cleans out a leaded gasoline tank. In the last three years, an average of approximately 70 tons/year of leaded tank bottoms have been treated.

Waste Staging Area

The waste staging area is used to process and store containers of hazardous wastes such as spent solvents and acid tars from the alkylation process. All hazardous wastes stored here are ultimately shipped to an offsite hazardous waste disposal facility. The waste staging area contains a palletized drum storage pad with a non-discharging sump, a drum crusher pad, a safety building, and segregated storage areas for specific wastes. The palletized storage pad and drum crusher pad both have secondary containment, provided by a reinforced concrete pads with six inch curbing and non-discharging sumps. The concrete pads and sumps are underlain with PVC liners. The maximum capacity of the 100' x 100' pad is 250 drums.

CONDITIONS

All conditions of the draft permit are based on requirements in Title 16, Chapter 44, ARM. These rules, which mirror federal requirements for obtaining a permit to operate a hazardous waste management facility, are adopted under the Montana Hazardous Waste Act (MHWA). MHWA was enacted to implement in Montana the federal hazardous waste program established by RCRA. The permit application, consisting of parts A and B, serves as a basis for the conditions in this draft permit. The facility must be operated as specified in the application and in the conditions of this permit to be in compliance. Permit noncompliance could result in enforcement action or permit termination.

The draft permit contains six "modules" or chapters, that focus on specific concerns:

Module I -- Standard Conditions
Module II -- General Facility Conditions
Module IIIa -- Land Treatment Units
Module IIIb -- Lead Weathering Tank
Module IIIc -- Waste Staging Area
Module IV -- Groundwater Monitoring
Module V -- Closure/Post-Closure
Module VI -- Special Conditions
Treatment Zone Separation
Demonstration

Module VI, Special Conditions, is unique to this draft permit. This module requires Exxon to demonstrate to DHES by October 7, 1988, that portions of the East Land Treatment Units are suitable for land treatment. DHES is concerned that, in some areas of the East Land Treatment Units, the water table is too close to the ground surface, making the area unsuitable for land treatment. Exxon will only be able to use those portions of the East Land Treatment Units which have a satisfactory separation between the treatment zone and the water table.

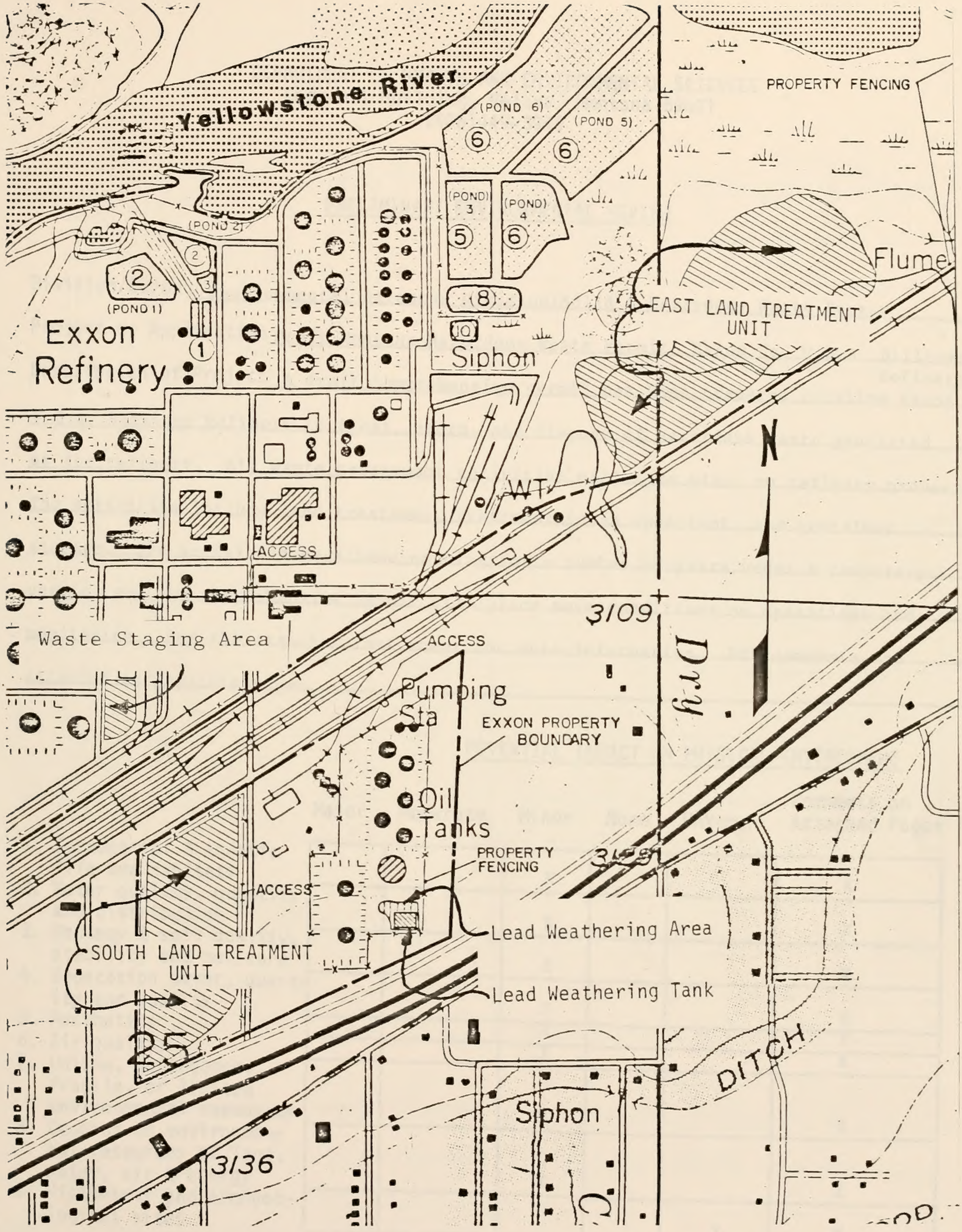
TERM OF PERMIT

The draft permit proposes a term of ten years for the permit. DHES is required under ARM 16.44.111 to review in detail the portions of the permit that apply to land treatment five years after the date of issuance, and to modify those portions of the permit as necessary.

DHES and Exxon recognize that the land disposal restrictions of the federal 1984 RCRA amendments may prohibit land treatment of refinery wastes beyond 1990. Such restrictions would override Exxon's ability to continue land treatment under a state-issued permit.

PUBLIC PARTICIPATION

MHWA requires a 45-day period for public comment on each draft permit. The public comment period for the Exxon permit will extend through September 26, 1988. A notice will be published in the Billings Gazette and will also be broadcast over local radio stations. A public hearing will be held on September 22, 1988, at the Student Union building on the Eastern Montana College Campus in Billings. The draft permit has been made available for public review during the comment period at the Yellowstone City-County Sanitarian's Office, Room 309, Courthouse (256-2757), and at the Billings office of the Montana Department of Health, Room 305, Petro Hall, Eastern Montana College Campus (657-2618).



Approximate Scale

1000 ft.

EXXON BILLINGS REFINERY

HAZARDOUS WASTE UNITS

8/88

DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES
Cogswell Building, Helena, Montana 59601
(406)449-3946

PRELIMINARY ENVIRONMENTAL REVIEW

Division/Bureau Environmental Sciences Division/Solid & Hazardous Waste Bureau

Project or Application Draft Montana Hazardous Waste Permit, Exxon Co. U.S.A. Billings Refinery

Description of Project A draft comprehensive permit has been prepared to allow Exxon Co. U.S.A. Billings Refinery to treat, store, and dispose of hazardous waste generated at the refinery. All waste management activities will take place on refinery property. The activities include land treatment, treatment in an open tank, and container storage. The activities have been ongoing for a number of years under a temporary permit, and the comprehensive permit will place more conditions on operations and monitoring. See the attached fact sheet for more information. PER comments are attached on separate pages.

POTENTIAL IMPACT ON PHYSICAL ENVIRONMENT

	Major	Moderate	Minor	None	Unknown	Comments on Attached Pages
1. Terrestrial & aquatic life and habitats			X			X
2. Water quality, quantity and distribution			X			X
3. Geology & soil quality, stability and moisture			X			X
4. Vegetation cover, quantity and quality			X			X
5. Aesthetics			X			X
6. Air quality			X			X
7. Unique, endangered, fragile, or limited environmental resources			X			X
8. Demands on environmental resources of land, water, air & energy			X			X
9. Historical and archaeological sites					X	X

DHES/ESD-1

POTENTIAL IMPACTS ON HUMAN ENVIRONMENT

	Major	Moderate	Minor	None	Unknown	Comments on Attached Pages
1. Social structures and mores				X		X
2. Cultural uniqueness and diversity				X		X
3. Local and state tax base & tax revenue				X		X
4. Agricultural or industrial production				X		X
5. Human health			X			X
6. Quantity and distribution of community and personal income				X		
7. Access to and quality of recreational and wilderness activities				X		
8. Quantity and distribution of employment				X		
9. Distribution and density of population and housing				X		
10. Demands for government services			X			X
11. Industrial & commercial activity			X			X
12. Demands for energy				X		
13. Locally adopted environmental plans & goals				X		
14. Transportation networks & traffic flows				X		

Other groups or agencies contacted or which may have overlapping jurisdiction Environmental Protection Agency, Water Quality Bureau, Air Quality Bureau

Individuals or groups contributing to this PER. Alice Stanley, Barbara Jones

Recommendation concerning preparation of EIS not recommended; the process of preparing a comprehensive permit application addresses physical environmental concerns

PER Prepared by: Alice Stanley, Barbara Jones

Date: August 12, 1988

DHES/ESD-2

PRELIMINARY ENVIRONMENTAL REVIEW
EXXON COMPANY U.S.A. BILLINGS REFINERY
DRAFT HAZARDOUS WASTE PERMIT

POTENTIAL IMPACT ON THE PHYSICAL ENVIRONMENT

1. Terrestrial and aquatic habitats: The proposed permit conditions will provide improved protection of aquatic and terrestrial species by requiring:

-Monitoring of Coulson irrigation ditch for contaminants before it leaves the facility boundary.

-Closure of any land treatment sectors located in areas of high groundwater. This will reduce the possibility of near surface groundwater from discharging contaminants to nearby swampy areas.

All units are outside of the Yellowstone River floodplain. The land treatment units have been diked to control run-on and run-off during a 25-year, 24-hour storm event.

2. Water quality, quantity, and distribution: There is a potential for impact on groundwater quality due to the land treatment units. Monitor well networks are in place around both land treatment units, and are sampled on a regular basis for hazardous constituents that could migrate from the units. No hazardous constituents have been detected to date in groundwater.

The proposed permit conditions will reduce the potential for groundwater contamination because:

-Groundwater monitoring parameters are increased to include hazardous indicator parameters.

-Soil pore water and soils monitoring frequency and parameters will be increased and standardized.

-Waste application rates and content will be limited, and reported on a more frequent basis.

-Closure and post-closure monitoring requirements will be outlined.

3. Geology and soil quality, stability, and moisture: There is a potential impact on soil quality in the land treatment units due to waste applications. Conservative application rates are established and soil sampling is required in the draft permit, to prevent overloading of soils.

The proposed permit conditions will improve soil quality in some parts of the facility through closure activities:

-Some portions of the east land treatment unit contain soils contaminated below the treatment zone. The proposed permit contains conditions require the excavation and treatment of those soils to reduce levels of hazardous constituents.

-Closure conditions in the proposed permit require in-place treatment and monitoring of land treatment unit soils until maximum degradation of hazardous organic constituents is achieved.

4. Vegetation cover, quantity, and quality: It is likely that EPA's land disposal restrictions will require Exxon to close the land treatment units within two years. Following in-place treatment at closure, a post-closure permit condition requires placement and maintenance of a vegetative cover on the land treatment areas. This condition can be expected to improve vegetative cover.

5. Aesthetics: All hazardous waste management units are located on the Exxon Refinery property. Any anticipated impacts these units may have on aesthetics is minor relative to other refinery activities.

6. Air quality: Both the land treatment units and the lead weathering tank may have a minor odor impact. However, the impact compared to air emissions and odors from the refinery is minor.

7. Unique, endangered, fragile, or limited environmental resources: Exxon has corresponded with the U.S. Fish and Wildlife Service regarding the possible occurrence of the bald eagle and the peregrine falcon in the project area. The potential for accumulation of hazardous constituents in fish or birds that may serve as prey species for the raptors does not appear to be likely. Exxon has taken the agency's comments into account when revising the permit application.

8. Demands on environmental resources of land, water, air, and energy: Although the land treatment process requires about 29 acres, this is property that would otherwise be used for industrial purposes. All the waste management processes are generally energy efficient.

9. Historical and archaeological sites: Exxon has corresponded with the Montana Historical Society about the potential impact of ongoing waste management activities on historic or archaeological sites. The historical society responded that since the waste management processes have been in place for a number of years, "adverse impacts to any cultural resources located in the area have already occurred if they are going to occur." Issuance of the comprehensive permit will not have any additional impact.

POTENTIAL IMPACTS ON THE HUMAN ENVIRONMENT

1-4. Social structures, cultural uniqueness, tax base and revenue, agricultural or industrial production: Hazardous waste management practices are now only a small part of ongoing industrial activity at Exxon. Issuance of a

comprehensive hazardous waste permit will not have an impact on the refinery in general, and therefore will not have an appreciable impact on community life.

5. Human health: Regulating the hazardous waste management units at Exxon through a comprehensive permit may improve human health in the community and at the refinery. Conditions written into the permit will reduce the likelihood of accidental contaminant releases to the environment.

10. Demands for government services: Although Exxon has a mutual aid agreement with the City of Billings Fire Department for services during emergencies, any city fire control materials used must be repaid in kind by Exxon. The agreement states that city personnel and equipment can be withdrawn to respond to another emergency within the city's jurisdiction. Additionally, Exxon has its own fire and emergency brigade, and mutual aid agreements with other local refineries.

Permitting Exxon's hazardous waste management units may increase the workload for state Health Department and EPA personnel.

11. Industrial and commercial activity: The permit will allow industrial activity to maintain its present capacity at the refinery because of reduced uncertainty about waste management options.

DRAFT FACT SHEET
FOR A HAZARDOUS WASTE MANAGEMENT FACILITY PERMIT
EXXON COMPANY U.S.A., BILLINGS REFINERY
BILLINGS, MONTANA
EPA ID. NO. MTD010380574

This fact sheet is for the Enironmental Protection Agency's (EPA's) portion of the full draft Resource Conservation and Recovery Act (RCRA) permit which EPA and the State of Montana intend to issue to the Exxon Company U.S.A., for operation of its storage, treatment, and disposal units located at the Billings, Montana Refinery. The full RCRA permit is comprised of EPA's permit, which addresses the provisions of the Hazardous and Solid Waste Amendments of 1984 (HSWA), and the State of Montana's permit, which addresses that portion of RCRA for which the State of Montana is authorized. Some of the provisions in the EPA portion of the permit are also included in the Montana State portion of the permit, since the State of Montana is in the process of amending its hazardous waste regulations to include relevant HSWA requirements. The State of Montana is authorized to administer and enforce those portions of RCRA in effect prior to the enactment of HSWA. This fact sheet was prepared in accordance with the requirements of 40 CFR 124.8.

A. PURPOSE OF THE PERMIT ISSUANCE PROCESS

The purpose of the permit issuance process is to afford the United States Environmental Protection Agency, interested citizens and other governmental agencies the opportunity to evaluate the ability of the Permittee to comply with the applicable requirements promulgated under the Resource Conservation and Recovery Act , as amended by the Hazardous and Solid Waste Amendments of 1984 . EPA is required to prepare a draft permit which sets forth in one concise document all the applicable requirements with which the Agency intends to require the Permittee to comply with during the duration of the permit. The public is given forty-five (45) days to review and comment on the draft permit conditions prior to EPA taking any final action on EPA's draft permit.

B. PROCEDURES FOR REACHING A FINAL DECISION

Section 7004(b) of RCRA and 40 C.F.R. 124.10 require that the public be given forty-five (45) days to comment on each draft permit prepared under the Resource Conservation and Recovery

Act. The comment period will begin on August 12, 1988 and will end on September 26, 1988. Any person interested in commenting on this draft permit must do so within this forty-five (45) day comment period.

All persons wishing to comment on any of the permit conditions should submit the comments in writing to the Environmental Protection Agency (EPA), Region VIII, Montana Office, 301 S. Park, Drawer 10096, Helena, Montana 59626, or to the address in the State permit. Comments should include all reasonably available references, factual grounds and supporting material.

A public hearing will be held at the Student Union Building on the Eastern Montana College Campus in Billings, Montana on August 22, 1988 at 7:00 pm to receive comments on the draft permit.

When making a determination regarding the issuance of this permit to Exxon Company U.S.A., EPA will consider all written comments received during the comment period; oral or written statements received during the public hearing; the requirements of the hazardous waste regulations of 40 C.F.R. Parts 124, 260 through 264, and 270; the Agency's permitting policies; and the HSWA.

When EPA makes a final permit decision to either issue, deny or modify this permit, notice will be given to the applicant and each person who submitted written comments or requested notice of the final decision. The final permit decision shall become effective thirty (30) days after the service of notice of the decision unless a later date is specified or review is requested under 40 C.F.R. 124.19. If no comments requested a change in this draft permit, the final permit shall become effective immediately upon issuance.

Contact person for the Exxon Company U.S.A. draft permit is:

Mr. Jim Harris
U.S. Environmental Protection Agency
Montana Office
301 S. Park, Drawer 10096
Helena, Montana 59626
[406] 449-5414

C. HAZARDOUS AND SOLID WASTE AMENDMENTS

CONTINUING RELEASES AT PERMITTED FACILITIES

Background

One of the most important provisions of the Hazardous and Solid Waste Amendments of 1984 is the requirement for corrective action for continuing releases. This provision is established in Section 3004(u) of RCRA, promulgated as regulation of 40 C.F.R. 264.101, 50 Federal Register 28747 (July 15, 1985), as follows:

> "Standards promulgated under this section shall require, and a permit issued after November 8, 1984 (the date of enactment of the Hazardous and Solid Waste Amendments of 1984) by the Administrator or a State shall require corrective action for all releases of hazardous waste or constituents from any solid waste management unit at a treatment, storage, or disposal facility seeking a permit under this subtitle, regardless of the time at which waste was placed in such unit. Permits issued under Section 3005 (of RCRA) shall contain schedules of compliance for such corrective action (where such corrective action cannot be completed prior to issuance of the permit) and assurances of financial responsibility for completing such corrective action."

The intent of Congress in establishing this permit requirement was to correct a perceived shortcoming in the existing statute and RCRA regulations, which allowed operating permits to be issued to facilities at which environmental contamination is occurring or has occurred, without the permit addressing that contamination. All permit applicants must now (a) identify all solid waste management units (SWMUs) at the facility, (b) identify any releases that have occurred or are occurring from those units, (c) take appropriate corrective action to clean up those releases, and (d) demonstrate financial assurance for those corrective actions. The provision on continuing releases was effective on the date of enactment (November 8, 1984). Thus, a permit issued after that date must address this provision.

The basic standard for imposing corrective action at the Exxon Billings Refinery is protection of human health and the environment. The EPA permit will address corrective action when there is or has been a probable release at the facility that poses a threat to human health and the environment. A substantial threat to human health and environment is assumed if there is a likelihood of a hazardous waste or hazardous constituent release from a solid waste management unit into the air, surface water, ground water, or soil.

Implementation

The process of implementing Section 3004(u) will take place in three stages, with each stage consisting of several specific steps, as follows:

1. Assessment of need for corrective action (RCRA Facility Assessment).
    a. Submission of Preliminary Review information by applicant.
    b. Evaluation of Preliminary Review information submitted by applicant to determine the possibility or extent of releases.
    c. Performance of a Visual Site Inspection by the Agency.
2. Existing data evaluation and development of proposed programs of corrective action.
    a. Verification Investigation by owner/operator to identify or verify releases.
    b. RCRA Facility Investigation, if necessary, by owner/operator to characterize releases.
    c. Development of a proposed program of corrective measures, if necessary, and cost estimate.
3. Selecting and performing corrective action.
    a. Establishing the program for corrective action.
    b. Demonstration of financial assurance.
    c. Conducting corrective action.

Information on solid waste management units was developed from state and federal files reviewed by the Agency. This included review of past RCRA Part B application submittals and inspection reports. A Visual Site Inspection was performed at the Exxon Billings Refinery on March 4, 1987. This permit contains conditions requiring Exxon to perform an evaluation of existing solid waste management units and other areas of concern. Once this is completed, EPA will evaluate the completed studies and determine if further action is warranted. If EPA finds that further studies and/or corrective measures are warranted, EPA will propose a permit modification and follow appropriate procedures which will

include a public notice period and a public hearing, if requested.

OTHER PROVISIONS

A number of other provisions in HSWA became effective November 8, 1984. Provisions concerning the standards for owners and operators of hazardous waste management facilities and provisions concerning general permit conditions were promulgated as final regulations on July 15, 1985 (50 Fed. Reg. 28742). One provision, in addition to that pertaining to corrective actions for continuing releases, applies to this permit.

Section 3005(h) of RCRA (Section 224 of HSWA) requires that, as of September 1, 1985, Permittees of hazardous waste management facilities located on the premises of the generator must certify that certain waste minimization practices have been established. This requirement has been incorporated into the regulations concerning the Operating Record of the facility [40 C.F.R. 264.73(b)(9)] (see Permit Condition I.F.). Regulation 40 C.F.R. 270.30(j)(2), 50 Fed. Reg. 18752 (July 15, 1985), was revised to clarify that this operating standard must be a condition of the Permit (see Permit Conditions I.H.2 and I.I.7.b.).

D. FACILITY DESCRIPTION

GENERAL

The Exxon Billings Refinery is located on approximately 730 acres, three miles east of Billings, Montana in Yellowstone County. The Refinery is located at latitude 45° 48' 58" and longitude 108° 26' 02", and is bounded on the north and partially to the west by the Yellowstone River.

The facility is a petroleum refinery which processes, treats, and transforms crude oil and other raw materials into refined hydrocarbon products, by-products, and intermediates. The facility primarily processes heavy domestic crude oil, with varying quantities of light Canadian crude, to a complete line of fuel products. The refinery began operation in July 1949 demonstrating a capacity of processing about 50,000 barrels per stream day [B/SD] of crude oil.

Process units operating at this facility include:

- Crude Distillation Unit [Atmospheric]
- Crude Distillation Unit [Vacuum]
- Fluid Catalytic Cracking Unit
- Fluid Coking Unit
- Hydrocracking Unit
- Powerforming Unit [Platinum Catalyst]
- Catalytic Reforming Unit [Hydrogen Production]
- Hydrodesulfurization of Diesel [HF #1]
- Hydrodesulfurization of Naphtha/Kerosene [HF #2]
- Hydrodesulfurization of Naphtha/Kerosene [HF #3]
- Alkylation Unit [Hydrogen Fluoride Catalyst]
- Saturate Light Ends Unit
- Unsaturate Light Ends Unit
- Virgin Naphtha Stabilizer

HAZARDOUS WASTE ACTIVITIES

Hazardous waste activities at the Exxon Billings Refinery are described in and regulated by the State of Montana's permit. Please refer to the State permit for information on these units: the drum storage area; the lead weathering tank; and the East and South Land Treatment Units.

SOLID WASTE MANAGEMENT UNITS

As part of the RCRA permit, EPA Region VIII proposes to regulate solid waste management units subject to the corrective action provision of HSWA. Solid waste management units (SWMUs) are any active or inactive unit at the facility from which hazardous waste or hazardous waste constituents might migrate, irrespective of when waste was placed in the unit or whether that unit was intended for the management of solid and/or hazardous wastes.

EPA Region VIII has completed a preliminary evaluation of the SWMUs at the facility based on (1) the RCRA permit application and related correspondence; (2) a Visual Site Inspection conducted on March 4, 1987 by representatives of EPA Region VIII; (3) a RCRA Facility Assessment report prepared by EPA Region VIII; and (4) RCRA Facility Assessment Guidance dated October 1986.

Forty one SWMU's and seven areas of concern were defined during this process. Included in the 41 SWMU's are 26 active units and 15 inactive units. The name and identifying number of the SWMU's and areas of concern are given in Table 1. Figure 1 illustrates the approximate location of the SWMU's on the facility.

E. PERMIT ORGANIZATION

The permit is divided into two parts as outlined below:

Part	Topic
I	Standard Conditions
II	Specific Conditions

Part I contains conditions which apply to all hazardous waste facilities. Part II pertains specifically to the hazardous waste facilities at the Exxon Billings Refinery, Billings, Montana. Both Parts I and II are administered by EPA.

Unit Number	Name
1	East land Treatment Area
2	South Land Treatment Area
3	Waste Staging Area
4	Lead Weathering Tank
5	HF Neutralization Tank
6	API Separator (Dirty Water Separator)
7	Product Loading Area API Separator
8, 9, 10	Slop Oil Storage Tanks
11	Induced Air Flotation Unit
12	IAF Wastewater Trench
13	Biological Oxidation Pond (Pond #3)
14, 15, 16	Wastewater Stabilization Ponds #4, #5, & #6
17	Pond #1
18	API Overflow Surface Impoundment
19	Clean Water Separator
20	Pond #2
21	Pond #2
22, 23	HF Sludge Settling Ponds
24	HF Sludge Drying Bed
25, 26	Oil Interceptor Trenches
Inactive SWMUs:	
27, 28, 29, 30, 31	North Land Disposal Sites
32	Northwest Land Disposal Area
33	Oily Waste Incineration Area
34	Old Surface Impoundment Site
35	Flare Gas Recovery Surface Impoundment Site
36	Coke Storage Area Surface Impoundment Site
37	East Land Disposal Area
38, 39	South Land Disposal Sites
40	Old Lead Weathering Area
41	Rotary Kiln
Areas of Concern:	
1	River Water Intake Pond
2	Clean Rubble Area
3	Product Coke Storage Area
4	Flare Stack
5, 6, 7	Underground Storage Tanks

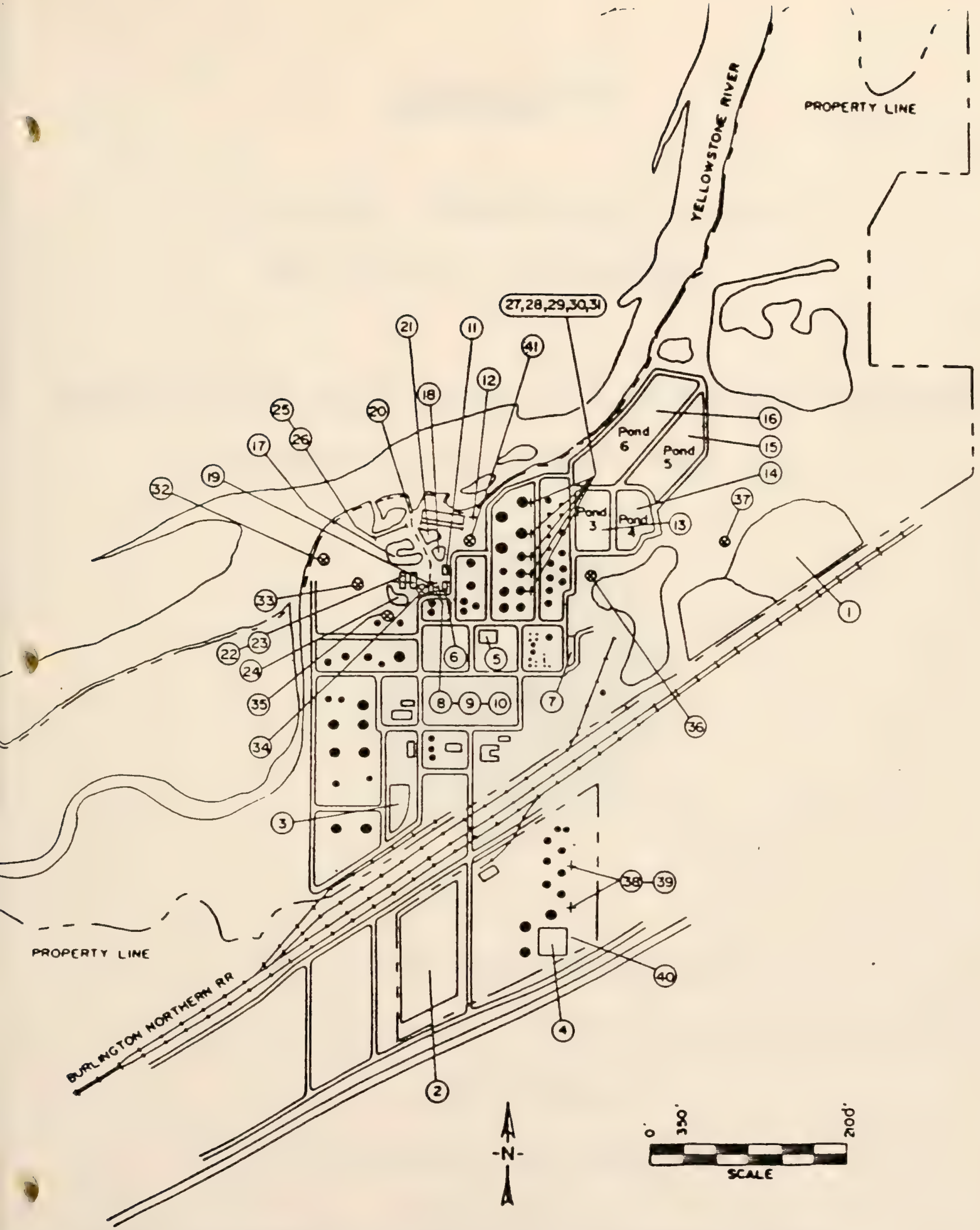


FIGURE 1. APPROXIMATE LOCATION OF ACTIVE AND INACTIVE SWMUs AT EXXON BILLINGS REFINERY.

DRAFT

EXXON COMPANY U.S.A.
BILLINGS REFINERY

MONTANA HAZARDOUS WASTE PERMIT
Permit No.MTHWP-88-01

Prepared by:

Solid and Hazardous Waste Bureau

Department of Health and Environmental Sciences

Cogswell Building

Helena, Montana 59620

(406)444-2821

August 12, 1988

Abbreviations Used in Permit

API	American Petroleum Institute
ARM	Administrative Rules of Montana
BTZ	Below Treatment Zone
CFR	Code of Federal Register
E	East
EP	Extraction Procedure
EPA	Environmental Protection Agency
FE	Freon Extractable Oil and Grease
HF	Hydrofluoric acid
MHWA	Montana Hazardous Waste Act
N	North
PHC	Principal Hazardous Constituents
pql	Practical Quantitative limits
R	Range
RCRA	Resource Conservation and Recovery Act
RL	Rate Limit
SW	Solid Waste
T	Township
TEL	Tetraethyl Lead

MONTANA HAZARDOUS WASTE PERMIT

Permit No. MTHWP-88-01

Permittee: Exxon
EPA Identification Number MTD010330574

Pursuant to the Montana Hazardous Waste Act (MHWA), a Permit is hereby issued to EXXON Company, U.S.A. (hereafter called the Permittee), to operate a hazardous waste storage facility located at latitude 45°49' and longitude 108° 26'. The facility consists of a containerized storage area, a TEL lead weathering treatment tank, and land treatment units.

This Permit consists of the conditions contained herein (including those in any attachments) and the applicable requirements in Title 16, Chapter 44, Administrative Rules of Montana (ARM) as specified in the Permit. Applicable regulations are those which are in effect on the date of issuance of this Permit (see ARM 16.44.110). The Permittee must comply with all of the terms and conditions of this Permit.

This Permit presumes that the information submitted in the Permit application attached to the Permittee's letter dated September 30, 1983, and as finally amended on August 5, 1988 (hereafter referred to as the Application), is accurate and that the facility will be constructed and operated as specified in the Application, except as modified by the attached conditions. Where portions of the Application are incorporated herein by reference, they are deemed to be part of this Permit. Any inaccuracies or misrepresentations found in the Application may be grounds for the revocation or modification of this Permit (see ARM 16.44.116 through 16.44.118). The Permittee must inform the Department of any deviation from or changes in the information in the Application or in on-site operations which would affect the Permittee's ability to comply with the applicable regulations or Permit conditions.

This Permit is effective as of October 1, 1988, and shall remain in effect through September 30, 1998, unless revoked and re-issued, or terminated.

Signature: ______________________________ Date: __________________

JOHN J. DRYNAN, M.D., Director
Montana Department of Health
and Environmental Sciences

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MODULE I

STANDARD CONDITIONS

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MODULE I - STANDARD CONDITIONS

A. DEFINITIONS

Application: The information submitted by Exxon in the Part B permit application attached to the Permittee's letter dated September 30, 1983, as modified by subsequent amendments dated August 5, 1988.

Department: The Montana Department of Health and Environmental Sciences.

Permittee: Exxon Company, U.S.A.

Permit: Montana Hazardous Waste Permit Number MTHWP-88-01 and all attachments.

B. EFFECT OF PERMIT

The Permittee is allowed to store and treat hazardous waste in accordance with the conditions of this permit. Any storage or treatment of hazardous waste not authorized in this permit is prohibited. Issuance of this permit does not convey property rights of any sort or any exclusive privilege; nor does it authorize any injury to persons or property, any invasion of other private rights, or any non-compliance with state or local law or regulations. Compliance with this permit constitutes compliance, for purposes of enforcement, with MHWA, provided that compliance with the terms of this permit does not constitute a defense to any order issued or any action brought under 75-10-411 or 75-10-415, MCA, Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. 9606(a), commonly known as CERCLA), or any other law providing for protection of public health or the environment.

C. PERMIT ACTIONS

This permit may be modified, revoked and reissued, or terminated for cause as specified in ARM 16.44.116 through ARM 16.44.118. The filing of a request for a permit modification, revocation and re-issuance, or termination or the receipt of notification of planned changes or anticipated noncompliance on the part of the Permittee does not stay the applicability or enforceability of any permit condition. Review of any application for a permit modification or renewal shall consider information needs and improvements in the state of control and measurement technology as well as changes in applicable regulations.

D. DURATION OF PERMIT

This permit is effective for a period of ten (10) years unless modified, terminated, or revoked and re-issued.

E. SEVERABILITY

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

F. DUTIES AND REQUIREMENTS

1. Duty to Comply

The Permittee shall comply with all conditions of this permit, except to the extent and for the duration such noncompliance is authorized by an emergency permit. Any permit noncompliance, other than noncompliance authorized by an emergency permit, constitutes a violation of MHWA and is

grounds for enforcement action, permit termination, revocation and re-issuance, modification, or denial of a permit renewal application.

2. Duty to Reapply

   If the Permittee wishes to continue an activity allowed by this permit after the expiration date of this permit, the Permittee shall submit a complete application for a new permit at least 180 days before this permit expires. The request shall contain a detailed description of the additional information needed based on field or laboratory results already collected under the permit.

3. Permit Expiration

   This permit and all conditions herein will remain in effect beyond the permit's expiration date if the Permittee has submitted a timely, complete application in compliance with ARM 16.44.119, ARM 16.44.120 and 40 CFR 270.15, as incorporated by reference in ARM 16.44.120 and through no fault of the Permittee, the Department has not issued a new permit.

4. Need to Halt or Reduce Activity Not a Defense

   It shall not be a defense for the Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

5. Duty to Mitigate In the event of noncompliance with the permit, the permittee shall take all reasonable steps to minimize releases to the environment, and shall carry out such measures as are reasonable to prevent significant adverse impacts on human health or the environment.

6. Proper Operation and Maintenance

The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facility or similar systems only when necessary to achieve compliance with the conditions of the permit.

7. Duty to Provide Information

The Permittee shall furnish to the Department, within a reasonable time, any relevant information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The Permittee shall also furnish to the Department, upon request, copies of records required to be kept by this permit.

8. Inspection and Entry

The Permittee shall allow an authorized representative of the Department, upon the presentation of credentials, to:

a. Enter at reasonable times upon the Permittee's premises where a regulated activity is located or conducted, or where records must be kept under the conditions of this permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

d. Sample or monitor, at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by MHWA, any substances or parameters at any location.

9. Monitoring and Records.

a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. The method used to obtain a representative sample of the wastes to be analyzed must be the appropriate method from Appendix I of 40 CFR Part 261 as incorporated by reference in ARM 16.44.351. Laboratory methods for wastes or other treatment media must be those specified in Test Methods for Evaluating Solid Waste Physical/Chemical Methods SW-846 (Second Edition, 1982), (SW-846); Standard Methods of Wastewater Analysis (Fifteenth Edition, 1980); or an equivalent method as specified in this Permit.

i. Methods used for sampling and analysis of waste stored in the containerized storage area shall be those specified in Module IIIc of the Permit.

ii. Methods used for sampling and analysis of wastes treated at the TEL Weathering Tank will be those specified in Module IIIb of the Permit.

iii. Methods used for sampling and analysis of wastes treated at the Land Treatment Units shall be those specified in Module IIIa of the Permit.

iv. Samples and measurements of soils, soil pore water, groundwater and surface water at the land treatment units shall be those specified in Modules IIIa and IV of the Permit.

b. The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports and records required by this permit, and records of all data used to complete the application for this permit for a period of at least 3 years from the date of the sample, measurement, report or record. These periods may be extended by request of the Department at any time and are automatically extended during the course of any unresolved enforcement action regarding this facility.

c. Records of monitoring information shall specify:

    i. The dates, exact place, and times of sampling or measurements;

    ii. The individuals who performed the sampling or measurements;

    iii. The dates analyses were performed;

    iv. The individuals who performed the analyses;

    v. The analytical techniques or methods used; and

    vi. The results of such analyses.

10. Reporting Planned Changes

The Permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to a permitted unit. Construction of new units may not begin until a permit or permit modification has been issued.

11. Anticipated Noncompliance

The Permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

12. Transfer of Permits

This Permit may be transferred to a new owner or operator only if it is modified or revoked and re-issued pursuant to ARM 16.44.115 or 16.44.116. Before transferring ownership or operation of the facility during its operating life, the Permittee shall notify the new owner or operator in writing of the requirements of Title 16, Chapter 44, ARM.

13. Twenty-four Hour Reporting

The Permittee shall report to the Department any noncompliance with the permit which may endanger health or the environment. Any such information shall be reported orally within 24 hours from the time the Permittee becomes aware of the circumstances. This report shall include the following:

a. Information concerning the release of any hazardous waste which may endanger public drinking water supplies.

b. Information concerning the release or discharge of any hazardous waste, or of a fire or explosion at the facility, which could threaten the environment or human

health outside the facility. The description of the occurrence and its cause shall include:

i. Name, address, and telephone number of the owner or operator;

ii. Name, address, and telephone number of the facility;

iii. Date, time, and type of incident;

iv. Name and quantity of materials involved;

v. The extent of injuries, if any;

vi. An assessment of actual or potential hazard to the environment and human health outside the facility, where this is applicable; and

vii. Estimated quantity and disposition of recovered material that resulted from the incident.

A written submission shall also be provided within 5 days of the time the Permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the periods of noncompliance (including exact dates and times); whether the noncompliance has been corrected; and if not, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance. The Permittee need not comply with the five-day written notice requirement if the Department waives the requirement and the Permittee submits a written report within fifteen days of the time the Permittee becomes aware of the circumstances.

14. Other Noncompliance

The Permittee shall report all other instances of noncompliance not otherwise required to be reported above, at the time monitoring reports, as required by this permit, are submitted. The reports shall contain the information listed in Condition F.12.

15. Other Information

Whenever the Permittee becomes aware that he failed to submit any relevant facts in the permit application, or submitted incorrect information in a permit application or in any report to the Department, the Permittee shall promptly submit such facts or information.

G. SIGNATORY REQUIREMENT

All reports or other information requested by the Department shall be signed and certified as required by ARM 16.44.108.

H. DOCUMENTS TO BE SUBMITTED PRIOR TO OPERATION

The Permittee shall submit all documents to the Department required under Module VI of the Permit by October 7, 1988.

I. DOCUMENTS TO BE MAINTAINED AT FACILITY SITE

The Permittee shall maintain at the facility, until closure is completed and certified by an independent registered professional engineer, the following documents and amendments, revisions and modifications to these documents:

1. Waste analysis plan as required by 40 CFR 264.13 [ARM 16.44.702] and this permit.

2. Personnel training documents and records as required by 40 CFR 264.16(d) [ARM 16.44.702].

3. Contingency plan as required by 40 CFR 264.53(a) [ARM 16.44.702].

4. Closure plan as required by 40 CFR 264.112(a) [ARM 16.44.702].

5. Cost estimate for facility closure 40 CFR 264.77 [ARM 16.44.702].

6. Operating record as required by 40 CFR 264.73 [ARM 16.44.702].

7. Inspection schedules as required by 40 CFR 264.15(b) [ARM 16.44.702].

MODULE II

GENERAL FACILITY CONDITIONS

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MODULE II - GENERAL FACILITY CONDITIONS

A. PERMITTED PROCESS UNITS

The Permittee is authorized to operate the following facility units for treatment and disposal of waste subject to the limitations described below. All waste management activities are to be confined to the following authorized facility units:

1. The South Land Treatment Unit is located in the center of Section 25, T1N, R26E as shown in Attachment II.1.

2. Any sector in the New East and Old East Land Treatment Units, located in the SW¼, of Section 19, T1N, R27E and the E½ SE¼ of Section 24, T1N, R26E, as shown in Attachment II.1., meeting the conditions outlined in Module VI of this Permit.

3. The TEL Lead Weathering Tank, located in the SE½, NE¼, of Section 25, T1N, R26E, as shown in Attachment III.c.3.

4. The Waste Staging Area, located in the NE¼, NW¼, of Section 25, T1N, R26E, as shown in Attachment III.c.3

B. HAZARDOUS WASTES AUTHORIZED

The Permittee is authorized to manage hazardous wastes listed in the application and described herein.

C. SPILLS

The Permittee shall decontaminate and/or remove all spills, leaks, and cleanup residue immediately after the spillage event and shall take all steps necessary to prevent surface water or groundwater contamination as a result of any spills.

D. DESIGN AND OPERATION OF FACILITY

The Permittee shall maintain and operate the facility to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous constituents to air, soil, or surface water which could threaten human health or the environment.

E. OFF-SITE WASTES

The Permittee shall receive no off-site hazardous wastes.

F. SAMPLING, MONITORING, AND ANALYSIS

The Permittee shall follow the sampling and analysis procedures and schedule described in Modules IIIa, IIIb, IIIc, and IV of this Permit.

G. SECURITY

The Permittee shall comply with the security provisions specified in Section 5 of the Application.

H. GENERAL INSPECTION REQUIREMENTS

The Permittee shall follow the inspection schedule outlined in Section 5.2.2 and Table 5-1 of the Application (Attachment II.2.). Inspection forms in Exhibit 5-5a through of the Application (Attachment II.3.) shall be completed for each inspection. The Permittee shall remedy any deterioration or malfunction discovered by an inspection as required by 40 CFR 264.15(c) as incorporated by reference in ARM 16.44.702. Records of inspections shall be kept as required by 40 CFR 264.15(d) as incorporated by reference by ARM 16.44.702.

I. PERSONNEL TRAINING

The Permittee shall conduct personnel training as required by 40 CFR 264.16 as incorporated by reference in ARM 16.44.702. This training program shall follow the conditions specified in Section 10 of the Application. The Permittee shall maintain training documents and records as required by 40 CFR 264.16 (d) and (e) as incorporated by reference in ARM 16.44.702.

J. GENERAL REQUIREMENTS FOR IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTE

The Permittee shall comply with the requirements of Conditions III.a.P. and Q., III.b.E. and III.c.H.

K. LOCATION STANDARDS

Any hazardous waste management unit or portion of a unit located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout or any hazardous waste by a 100-year flood.

L. PREPAREDNESS AND PREVENTION

The Permittee shall comply with all conditions specified in Section 5 of the Application.

M. CONTINGENCY PLAN

1. Implementation of Plan

The Permittee shall immediately carry out the provisions of the contingency plan specified in Section 6 of the Application, and follow the emergency procedures described by 40 CFR 264.56 as incorporated by reference in ARM 16.44.702

whenever there is a fire, explosion, or release of hazardous waste or constituents which threaten or could threaten human health or the environment.

2. Annual Reports and Fees

The Permittee shall comply with the reporting requirements of ARM 16.44.404, ARM 16.44.417 and shall be subject to the fee schedules of ARM 16.44.125 and ARM 16.44.404, as applicable.

N. MANIFEST SYSTEM

The Permittee shall comply with the manifest requirements specified in Section 7.1 of the Application (Attachment II.4.).

O. RECORDKEEPING AND REPORTING

1. The Permittee shall maintain a written operating record at the facility in accordance with Section 7 of the Application and Conditions III.a.H., III.b.K, III.c.K., and IV of the Permit.

2. The Permittee shall comply with the annual report requirements of ARM 16.44.703.

P. LIABILITY REQUIREMENTS

The Permittee shall demonstrate continuous compliance with the requirements in ARM 16.44.817 through 16.44.822 and the documentation requirements of permit Condition V.N., including the requirements to have and maintain liability coverage for sudden and accidental occurrences in the amount of at least $1 million per occurrence with an annual aggregate of at least $2 million, exclusive of legal defense costs. Changes in the liability coverage mechanism must be approved by the Department.

Q. INCAPACITY OF PERMITTEE, GUARANTORS, OR FINANCIAL INSTITUTION

The Permittee shall comply with ARM 16.44.816.

R. CLOSURE

1. Performance Standard

The Permittee shall close each unit in accordance as required by 40 CFR 264.111 as incorporated by reference in ARM 16.44.702 and in accordance with the closure plan described in Modules IIIa, IIIb, IIIc, IV.I., and V.

2. Disposal or Decontamination of Equipment

The Permittee shall decontaminate and/or dispose of all facility equipment as required by 40 CFR 264.114 as incorporated by reference in ARM 16.44.702.

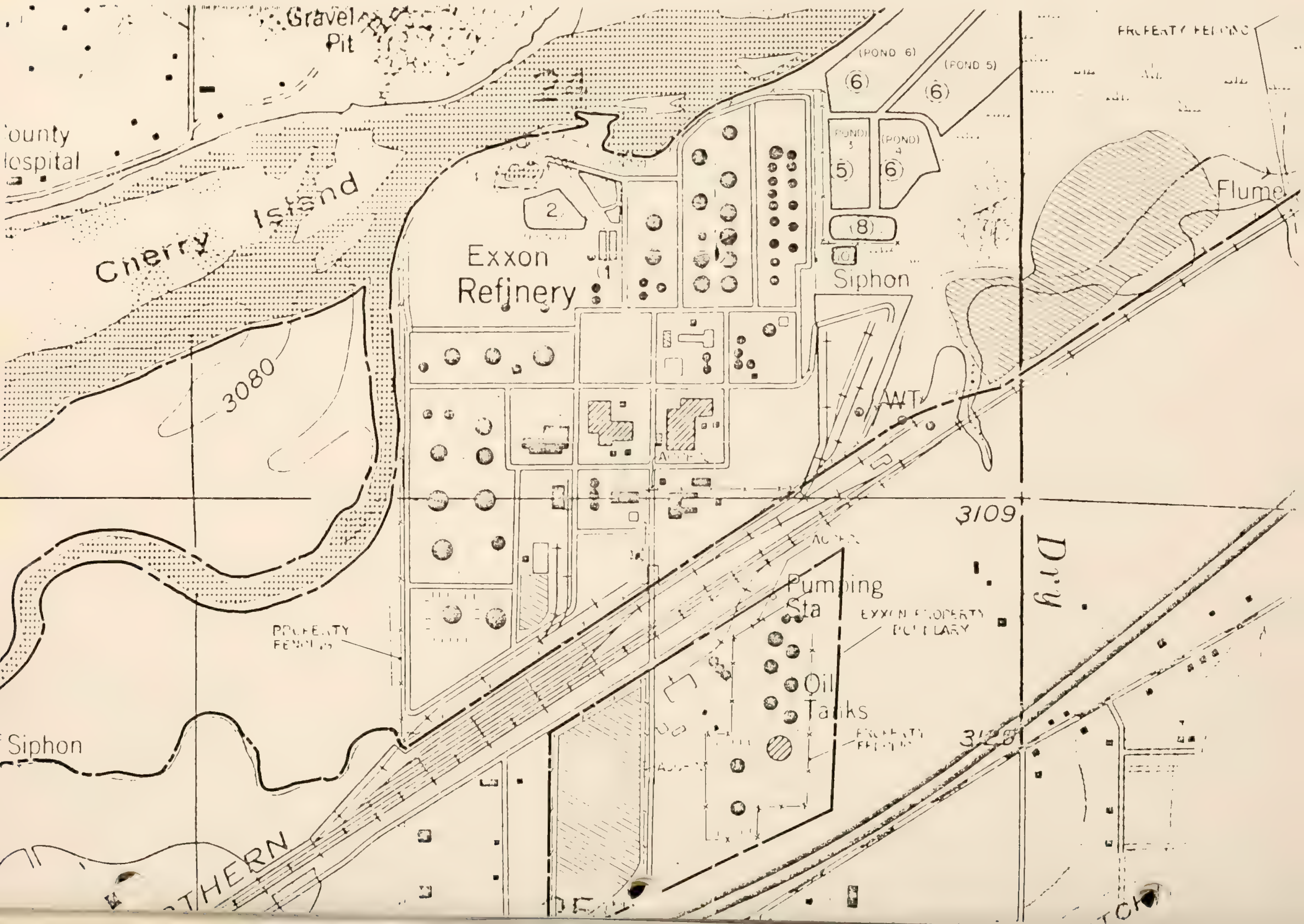
Attachments
Module II
General Facility Conditions

List of Attachments
Module II -- General Facility Conditions

Attachment II.1.	Map showing Regulated Units
Attachment II.2.	Inspection Schedule
Attachment II.3.	Inspection Forms
Attachment II.4.	Manifest Requirements

ATTACHMENT II.1.

ATTACHMENT II.1.



ATTACHMENT II.2.

Table 5-1. INSPECTION SCHEDULE FOR THE HAZARDOUS WASTE FACILITIES AT THE EXXON BILLINGS REFINERY

Area/Equipment	Specific Item	Type of Problem	Frequency of Inspections
Safety and Emergency Equipment	Standard industrial absorbents	Low stock	Monthly/as needed
	Pumps	Power, clogging	Monthly
	Flexible hoses with quick couple fittings	Cracks or holes, fittings stick	Monthly
	55 gallon drums (steel, stainless steel)	Corrosion, structural damage	Monthly
	Face shields	Broken or dirty equipment	Monthly
	Fire and safety equipment	-----------	Per Exxon Safety Inspection Schedule
	Protective clothing	Holes, normal wear and tear	As used
Security Devices	Refinery perimeter, fences and gates	Corrosion, damage to chain-link fence or barbed wire	Daily
	Refinery perimeter, warning signs	Missing, damaged	Daily
Waste Staging Area	Concrete pads and curb walls	Cracks, liquids standing, signs of leaks	Weekly
	Sumps	Cracks, liquids standing	Weekly and after storms

Table 1. (Concluded)

Area/Equipment	Specific Item	Type of Problem	Frequency of Inspections
	Pumps	Power, clogging	Monthly, if in use
	Containers	Leaks, container in poor condition. Container not closed. Corrosion, placement	Weekly
	Fence and warning signs	Fence secure. Signs in place and visible.	Weekly
Lead Weathering Tank	Tank	Corrosion, discoloration, cracks, etc.	Weekly
	Tank pad	Cracks, spills	Weekly
	Dike	Leakage, erosion, deterioration	Weekly
	Fence	Secure, gate locked	Daily
	Warning signs	Present, visible	Daily
	Freeboard	Insufficient freeboard	Daily
Land Treatment Areas	Warning signs, fences	Security	Daily
	Dikes	Leakage, erosion	Weekly

Waste Staging Area

This area will be inspected weekly for leaks or deterioration caused by corrosion or other factors. If a leaky container is found, its contents will be transferred to a container in good condition. The integrity of the fence surrounding the area will be verified. When loading and unloading activities are being conducted at the Waste Staging Area (which is very infrequently, based on our experience), personnel will inspect the unit daily. It should be noted that unauthorized personnel are not allowed into the area, thus inspection is ongoing for the items in Table 5-1 whenever they are inside the unit, i.e., when loading or unloading.

Land Treatment Areas

The dikes surrounding these areas will be inspected weekly and after storms to detect erosion or obvious signs of leakage, such as wet spots or dead vegetation. Deterioration will be remedied, as necessary. Groundwater monitoring wells and lysimeters will be inspected to ensure they have not been altered by land tilling equipment. The presence of warning signs will be checked.

Lead Weathering Tank

This is a batch operation and does not require overfilling control equipment. The tank contains no pressure or temperature monitors because it is an open tank. Perimeter fencing, warning sign presence, and the adequate freeboard level of the waste will be checked daily by the security guards. The tank and surrounding area will be inspected weekly to detect corrosion, erosion, and leaking seams or signs of leakage.

5.2.2 Inspection Schedule

Table 5-1 presents a schedule for the inspection program that summarizes the general area/equipment to be inspected, specific items to be inspected, types of problems to be detected, and the inspection frequency. Exhibits 5-6 through 5-8 are typical inspection forms for the respective units.

If inspections of the Exxon Billings facilities reveal that a hazard is imminent or has already occurred at any time between inspections, remedial action will be immediately undertaken. Exxon personnel will immediately notify the appropriate authorities listed in the Contingency Plan (Section 6.0) and initiate the remedial action. In the event of an emergency involving the release of hazardous substances in the environment, efforts will be made to contain the hazard, remove it, and decontaminate the affected area. A detailed description of emergency response procedures is included in the Contingency Plan. If inspections reveal that non-emergency maintenance is needed, it will be completed as soon as possible to prevent any further damage.

Only visual inspection results for each hazardous waste management unit are recorded on inspection sheets which are placed in the facility operating record. Each log sheet contains the date and time of inspection, name of inspector, notation of the observances made, and the date and nature of any repairs or other remedial actions. Sample log sheets are included in Exhibits 5-6 through 5-8. The inspection log sheets are maintained for all units in the Process Department Files (RCRA Operating Record-Inspections). The log sheets from each treatment unit will be inserted at least annually in the facility operating records. As required by 40 CFR 264.15, inspection records are kept at least 3 years from the date of inspection.

The lead weathering tank is thoroughly inspected for shell thickness using ultrasonic or similar techniques during turnaround. The tank is inspected at least every ten years, which is consistent with normal refinery inspection procedures. This ten year interval is typical of experience throughout the industry for tanks in service like this. Target minimum shell thickness of 0.125 inches is an industry standard for tanks and ensures adequate strength until thinned steel area can be repaired. Tank bottom thickness can be determined with a pit-gauge caliper to determine localized pit corrosion. The same minimum thickness of 0.125 inches applies. An external inspection by ultrasonic tests may be conducted at five year intervals between the 10 year period of major inspection. For thorough inspection, the tank is completely emptied of all solid hazardous wastes into barrels using shovels, steel and soft brooms. The tank is then washed with water and the water collected by vacuum truck for disposal into the dirty water sewer. Shovels and brooms are barrelled for disposal at a Class I facility. Internal inspection can then proceed.

ATTACHMENT II.3.

EXHIBIT 5-5A

DAILY FACILITY INSPECTIONS OF PERIMETER FENCE AND LEAD WEATHERING TANK FREEBOARD

Date and Time:

Waste Container Staging Area

		Yes	No
1.	Is Refinery perimter fence secure and in good condition?	____	____

East Land Treatment Area

		Yes	No
1.	Is perimeter fence secure and in good condition?	____	____

South Land Treatment Area

		Yes	No
1.	Is perimeter fence secure and in good condition?	____	____

Lead Weathering Tank

		Yes	No
1.	Is perimeter fence secure and in good condition?	____	____
2.	Is there at least two feet of freeboard?	____	____

Repairs or attention needed (specify):

Remedial action taken:

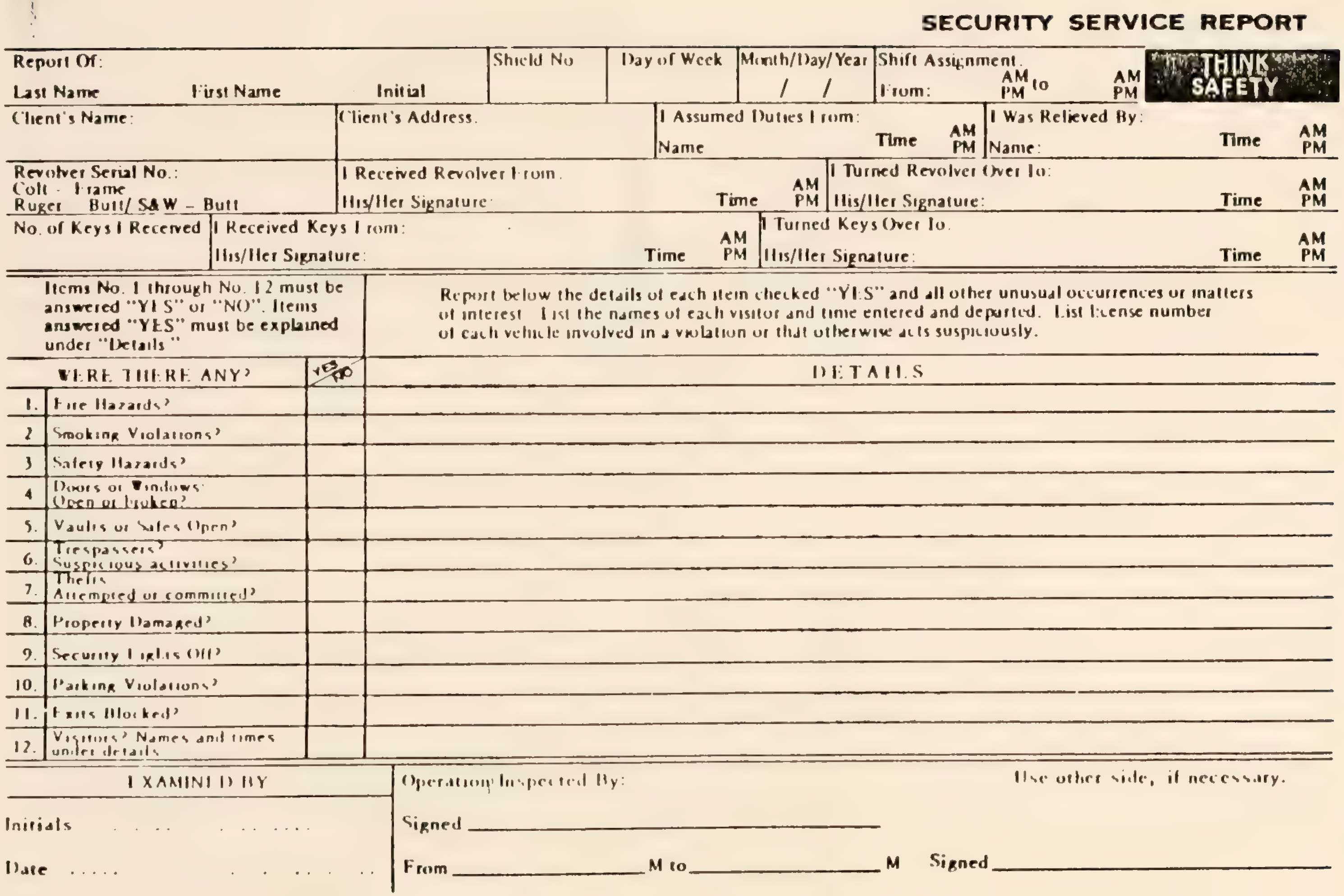
Additional Observations:

I have inspected these facilities and noted any discrepancies:

Inspector ______________________________

Return daily to Process Secretary

Exhibit 5-5.



SECURITY SERVICE REPORT

Report Of: Last Name First Name Initial	Shield No	Day of Week	Month/Day/Year / /	Shift Assignment. From: AM PM to AM PM	THINK SAFETY

Client's Name:	Client's Address.	I Assumed Duties From: Name Time AM PM	I Was Relieved By: Name: Time AM PM
Revolver Serial No.: Colt - Frame Ruger Butt/ S&W - Butt	I Received Revolver From. His/Her Signature: Time AM PM		I Turned Revolver Over To: His/Her Signature: Time AM PM
No. of Keys I Received	I Received Keys From: His/Her Signature: Time AM PM		I Turned Keys Over To. His/Her Signature: Time AM PM

Items No. 1 through No. 12 must be answered "YES" or "NO". Items answered "YES" must be explained under "Details."

Report below the details of each item checked "YES" and all other unusual occurrences or matters of interest. List the names of each visitor and time entered and departed. List license number of each vehicle involved in a violation or that otherwise acts suspiciously.

	WERE THERE ANY?	YES/NO	DETAILS
1.	Fire Hazards?		
2	Smoking Violations?		
3	Safety Hazards?		
4	Doors or Windows: Open or broken?		
5.	Vaults or Safes Open?		
6.	Trespassers? Suspicious activities?		
7.	Thefts Attempted or committed?		
8.	Property Damaged?		
9.	Security Lights Off?		
10.	Parking Violations?		
11.	Exits Blocked?		
12.	Visitors? Names and times under details		

EXAMINED BY

Initials

Date

Operation Inspected By:

Use other side, if necessary.

Signed

From M to M Signed

ATTACHMENT II.4.

7.0
MANIFESTING, RECORD KEEPING, AND REPORTING

This section addresses manifesting, record keeping, and reporting procedures at the Exxon Billings Refinery. Exxon is complying with the applicable requirements of 40 CFR 264.70, 264.73, 264.74, 264.75, and 264.77. The requirements of 40 CFR Parts 264.71, 264.72, and 264.76 are not applicable because the Exxon Billings Refinery does not receive off-site hazardous waste. The information in this section is not required under 40 CFR Part 270. It has been provided solely for informational purposes and should not be considered an official part of the application affecting acceptability or permit issuance. The internal procedures described in this section may be subject to modification depending on future internal and external developments.

7.1 MANIFESTING

The Exxon Billings refinery has both internal and external manifesting programs.

The internal program is designed to track wastes generated in the refinery and to track those wastes that are also disposed of in the refinery.

Containerized Waste

Wastes are placed into containers at the generating source with material, origin and date clearly painted on each drum. The containers are then transported to the Waste Staging Area (WSA) and the waste is entered on the Waste Staging Area Log by the warehouseperson at the WSA (Exhibit 7-1). The Stores Supervisor then uses the information on the waste description sticker, his or her knowledge of the waste, and consultations with the Environmental Engineer to classify the waste as hazardous or non-hazardous.

After classification, the warehouseperson attaches the appropriate label to the container (Exhibit 7-2 or 7-3). If the waste is hazardous, it is placed on the palletized drum storage pad, and if non-hazardous, placed in the appropriate area of the WSA.

Once per week the waste staging area log is delivered to the Environmental Engineer for filing in the operating record (i.e., Environmental Department files).

Land Treated Wastes

Wastes to be treated and disposed in the land treatment areas are collected by vacuum and dump trucks. Each time a truck picks up a waste, the vacuum or dump truck operator fills out the manifests (Exhibits 7-4, or 7-5, respectively). These completed manifests are delivered to the Environmental Engineer for entry into a computer database.

Leaded Waste

Leaded wastes are collected from the leaded product tanks by vacuum trucks. Each time the vacuum truck picks up a leaded waste, the operator fills out the vacuum truck manifest (Exhibits 7-4). The completed manifests are returned to the Environmental Engineer for filing in the operating record.

Waste materials to be shipped off-site are normally placed in containers and manifested for external disposal. In addition to the manifest labeling of the containers previously described, Exxon is required, by their contract disposer, to complete a Generators Waste Material Profile Sheet (Exhibit 7-6) describing each waste and to complete the Hazardous Waste Manifest (Exhibit 7-7). Permission of the Oregon State Environmental Department is also required prior to shipping any hazardous materials to a Class I disposal facility in this state. The chemical transportation manifest is completed in accordance with Title 49 DOT shipping regulations. Copies of these forms are delivered to the PES Secretary for filing in the operating record.

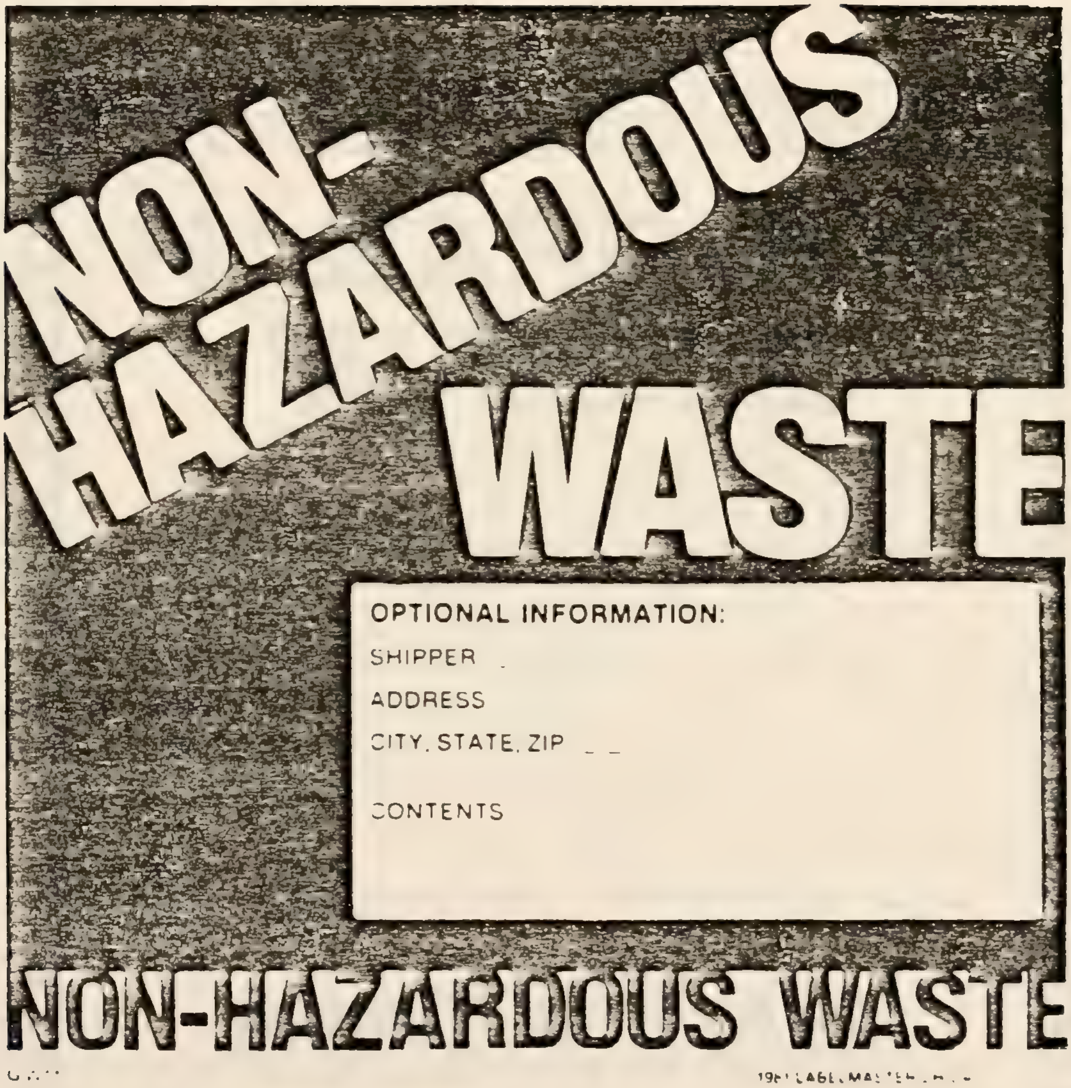
Exhibit 7-1

WASTE STAGING AREA LOG

	TRANSPORTER	MATERIAL	AMOUNT	DATE
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				

Upon completion, send a copy of this form to the Environmental Engineer and send the original to the Stores Supervisor for filing and inventory recording.

Exhibit 7-2



NON-HAZARDOUS WASTE

OPTIONAL INFORMATION:

SHIPPER

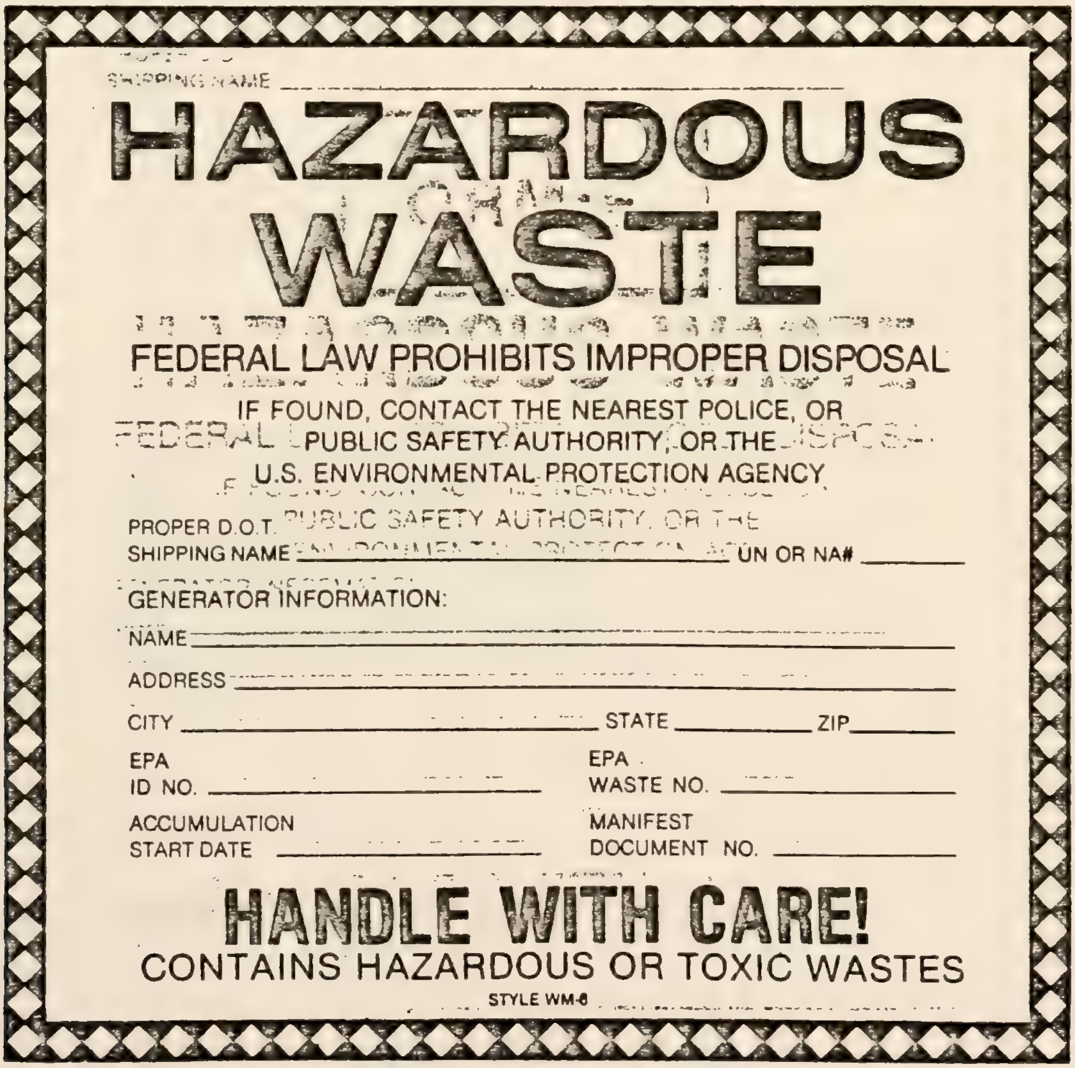
ADDRESS

CITY, STATE, ZIP

CONTENTS

NON-HAZARDOUS WASTE

Exhibit 7-3



HAZARDOUS WASTE

FEDERAL LAW PROHIBITS IMPROPER DISPOSAL

IF FOUND, CONTACT THE NEAREST POLICE, OR
PUBLIC SAFETY AUTHORITY, OR THE
U.S. ENVIRONMENTAL PROTECTION AGENCY

PROPER D.O.T.
SHIPPING NAME ____________________ UN OR NA# ________

GENERATOR INFORMATION:

NAME ____________________

ADDRESS ____________________

CITY ____________________ STATE ________ ZIP ________

EPA
ID NO. ____________________

EPA
WASTE NO. ____________________

ACCUMULATION
START DATE ____________________

MANIFEST
DOCUMENT NO. ____________________

HANDLE WITH CARE!

CONTAINS HAZARDOUS OR TOXIC WASTES

STYLE WM-6

© LABELMASTER, CHICAGO, IL. 60626

Exhibit 7-4

LANDFARM WASTE APPLICATION TICKET

(FOR VACUUM TRUCKS ONLY)

TICKET NUMBER :

DATE (MM/DD/YY) : _ _ / _ _ / _ _

DRIVER'S INITIALS : _ _ _

TRUCK ID (CIRCLE ONE) :

E-43
E-26
BS56...(BILLINGS SEWER #56)
OTHER..(SPECIFY) ____________________

SOURCE CODE (CIRCLE ONE) :

APISP.......API SEPERATOR
ASPHT.......ASPHALT AREA
IAFFL.......IAF FLOATATION UNIT
LRSEP.......LOADING RACK SEPERATOR
POND1.......POND #1
POND2.......POND #2
POND4.......POND #4
TK022.......SLOP OIL TANK #22
TK023.......SLOP OIL TANK #23
TK024.......SLOP OIL TANK #24
OTHER.......(SPECIFY) ____________________

WASTE CODE (CIRCLE ONE) :

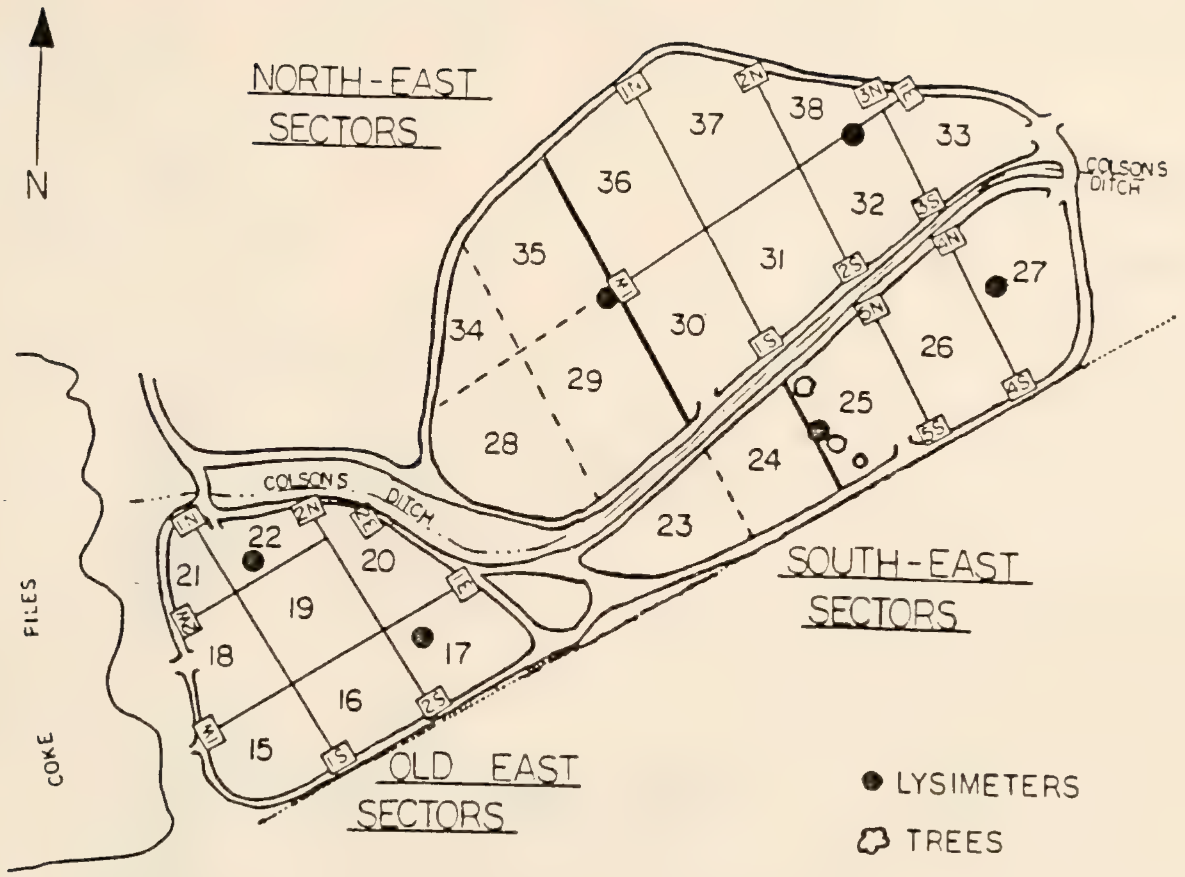
APISP.......API SEPERATOR SLUDGE
CRUDE.......CRUDE TANKAGE BOTTOMS
IAFFL.......IAF FLOAT SLUDGE
INTRM.......INTERMEDIATE TANKAGE BOTTOMS
LIMES.......BOILER HOUSE LIME SLUDGE
PONDS.......PONDS
SOESS.......SLOP OIL EMULSION SOLIDS
UNLED.......UNLEADED PROD. TANK BOTTOMS
OTHER.......(SPECIFY) ____________________

NUMBER OF LOADS ON THIS TICKET : ______

SECTORS TO WHICH WASTE WAS APPLIED (UP TO 14 SECTORS) :

(_ _) (_ _) (_ _) (_ _) (_ _) (_ _) (_ _)
(_ _) (_ _) (_ _) (_ _) (_ _) (_ _) (_ _)

USING THE MAP ON THE BACK OF THIS PAGE, AS ACCURATELY AS POSSIBLE, DRAW THE PATH TAKEN AS THE WASTE WAS SPREAD ONTO THE LANDFARM.


N
NORTH-EAST SECTORS
SOUTH-EAST SECTORS
OLD EAST SECTORS
COLSONS DITCH
COLSONS DITCH
FILES
COKE
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
1N
2N
3N
1E
1S
2S
1W
2W
3E
4S
5S
● LYSIMETERS
TREES

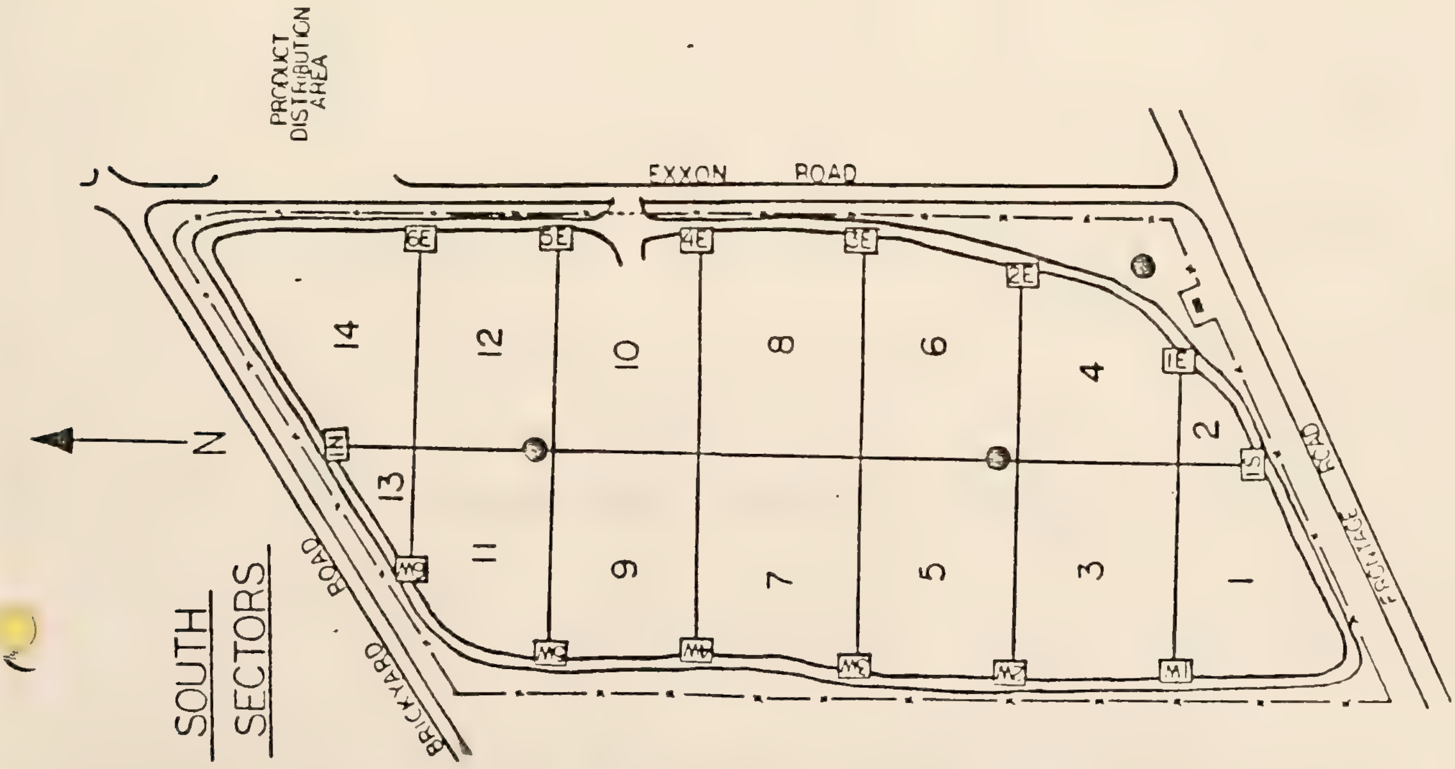

N
SOUTH SECTORS
PRODUCT DISTRIBUTION AREA
EXXON ROAD
BRICKYARD ROAD
FRONTAGE ROAD
1
2
3
4
5
6
7
8
9
10
11
12
13
14
1N
1S
1E
2E
3E
4E
5E
6E
1W
2W
3W
4W
5W
6W

Exhibit 7-5

LANDFARM WASTE APPLICATION TICKET

(FOR DUMP TRUCKS ONLY)

TICKET NUMBER :

DATE (MM/DD/YY) : _ _ / _ _ / _ _

DRIVER'S INITIALS : _ _ _

TRUCK ID : DUMP

SOURCE CODE (CIRCLE ONE) :

APISP.......API SEPERATOR
ASPHT.......ASPHALT AREA
LRSEP.......LOADING RACK SEPERATOR
POND1.......POND #1
POND2.......POND #2
POND4.......POND #4
OTHER.......(SPECIFY)________________________________

WASTE CODE (CIRCLE ONE) :

APISP.......API SEPERATOR SLUDGE
CRUDE.......CRUDE TANKAGE BOTTOMS
CSOIL.......CONTAMINATED SOIL
INTRM.......INTERMEDIATE TANKAGE BOTTOMS
PONDS.......POND SLUDGE
UNLED.......UNLEADED PROD. TANK BOTTOMS
OTHER.......(SPECIFY)
____

<--- GROSS WT.

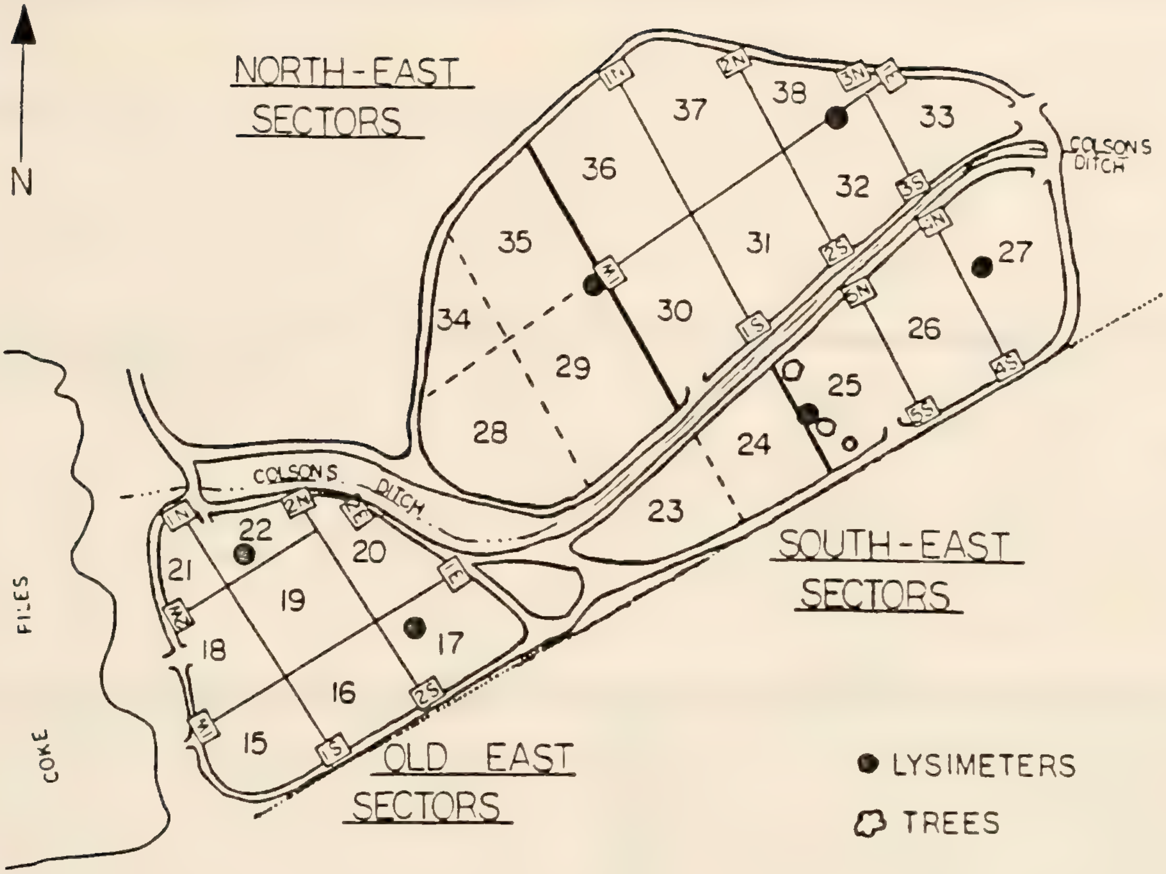
<--- TARE WT.

NET WEIGHT PER LOAD (LBS.) : ________________ <--- NET WT.

SECTORS TO WHICH WASTE WAS APPLIED (UP TO 6 SECTORS) :

SECTOR	LOADS	SECTOR	LOADS	SECTOR	LOADS
(_ _)	(_ _)	(_ _)	(_ _)	(_ _)	(_ _)
(_ _)	(_ _)	(_ _)	(_ _)	(_ _)	(_ _)

USING THE MAP ON THE BACK OF THIS PAGE, AS ACCURATELY AS POSSIBLE, PLACE AN "X" AT THE SPOT WHERE EACH LOAD WAS DUMPED ON THE LANDFARM.


N
NORTH-EAST SECTORS
SOUTH-EAST SECTORS
OLD EAST SECTORS
COLSONS DITCH
COLSONS DITCH
FILES
COKE
15
16
17
18
19
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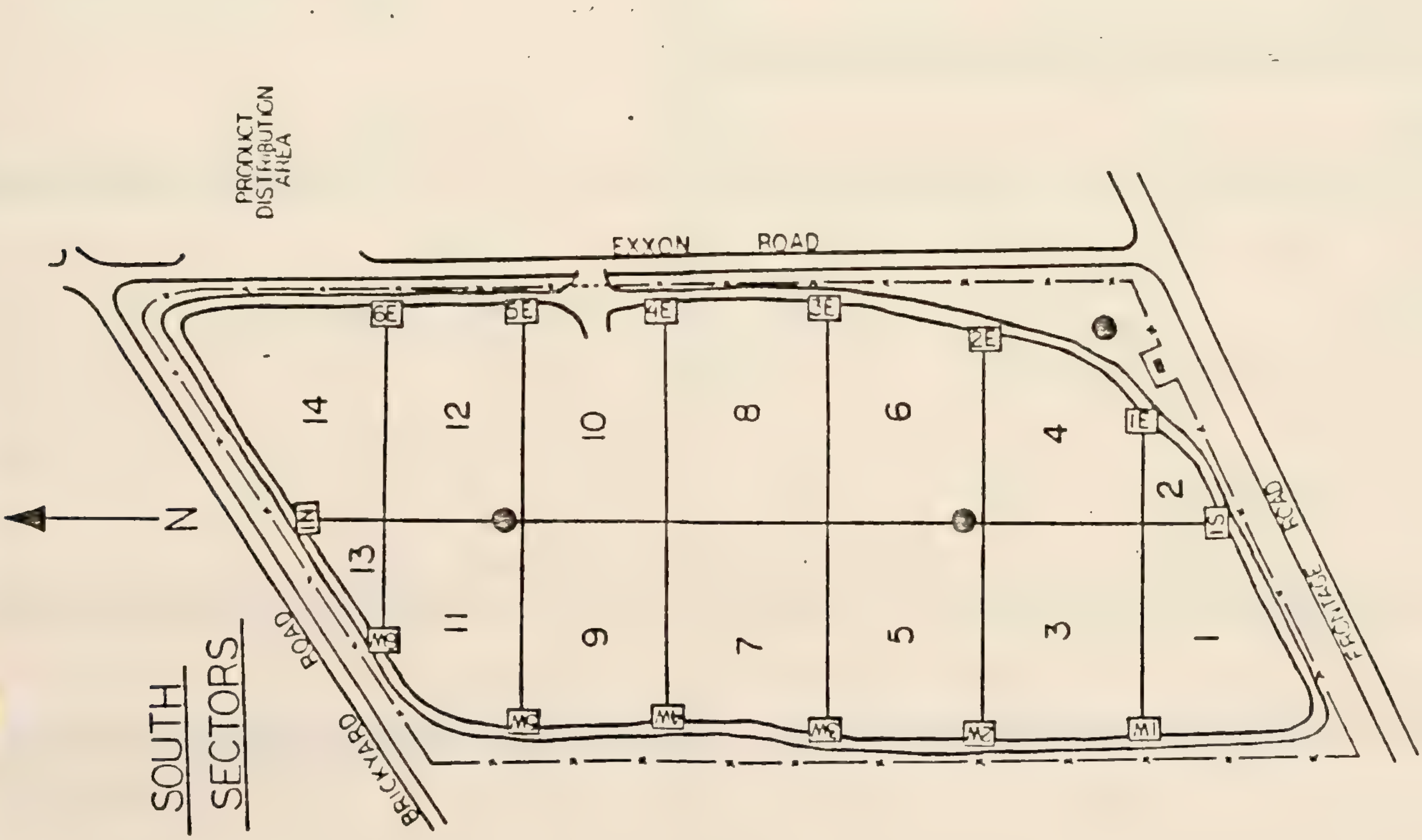
38
● LYSIMETERS
TREES


SOUTH SECTORS
N
EXXON ROAD
BRICKYARD ROAD
FRONTAGE ROAD
PRODUCT DISTRIBUTION AREA
1
2
3
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7
8
9
10
11
12
13
14

Waste Management, Inc. Exhibit 7-6

GENERATOR'S WASTE MATERIAL PROFILE SHEET

WASTE PROFILE SHEET CODE

TSDR ____ F25870

A GENERAL INFORMATION

'ERATOR NAME. ____ TRANSPORTER ____

.CILITY ADDRESS ____ TRANSPORTER PHONE ____

____ GENERATOR USEPA I D ____

____ GENERATOR STATE I D ____

TECHNICAL CONTACT: ____ TITLE ____ PHONE ____

NAME OF WASTE ____

PROCESS GENERATING WASTE: ____

B PHYSICAL CHARACTERISTICS OF WASTE

COLOR

ODOR ☐ NONE ☐ MILD ☐ STRONG

DESCRIBE ____

PHYSICAL STATE @ 70°F ☐ SOLID ☐ SEMI-SOLID ☐ LIQUID ☐ POWDER

LAYERS ☐ MULTILAYERED ☐ BI-LAYERED ☐ SINGLE PHASED

FREE LIQUIDS ☐ YES ☐ NO

VOLUME ____ %

pH. ☐ < 2 ☐ 2-4 ☐ 4.1-6.9 ☐ 7 ☐ 7.1-10 ☐ 10.1-12.5 ☐ > 12.5 ☐ EXACT ____ ☐ N/A

SPECIFIC GRAVITY ☐ < .8 ☐ .8-1.0 ☐ 1.1-1.2 ☐ EXACT ____ ☐ 1.3-1.4 ☐ 1.5-1.7 ☐ > 1.7

FLASH POINT ☐ < 70°F ☐ 70°F - 100°F ☐ 101°F - 139°F ☐ 140°F - 200°F ☐ > 200°F ☐ NO FLASH ☐ EXACT ____ ☐ CLOSED CUP ☐ OPEN CUP

C CHEMICAL COMPOSITION (TOTALS MUST ADD TO 100%)

____ ____ %

____ ____ %

____ ____ %

____ ____ %

____ ____ %

____ ____ %

____ ____ %

____ ____ %

____ ____ %

____ ____ %

D METALS ☐ TOTAL (PPM) ☐ EPA EXTRACTION PROCEDURE (mg/L)

ARSENIC (As) ____

BARIUM (Ba) ____

CADMIUM (Cd) ____

CHROMIUM (Cr) ____

MERCURY (Hg) ____

LEAD (Pb) ____

CHROMIUM HEX (Cr + 6) ____

SELENIUM (Se) ____

SILVER (Ag) ____

COPPER (Cu) ____

NICKEL (Ni) ____

ZINC (Zn) ____

THALLIUM (Tl) ____

____ ____

E OTHER COMPONENTS - TOTAL (PPM)

CYANIDES ____ PCB'S ____

SULFIDES ____ PHENOLICS ____

F SHIPPING INFORMATION

D.O.T. HAZARDOUS MATERIAL? ☐ YES ☐ NO

PROPER SHIPPING NAME ____

HAZARD CLASS ____ I.D. NO ____ RQ ____

METHOD OF SHIPMENT: ☐ BULK LIQUID ☐ BULK SOLID ☐ DRUM (TYPE/SIZE) ____

ANTICIPATED VOLUME ____ GALS ____ CUBIC YARDS

____ OTHER ____

PER. ☐ ONE TIME ☐ WEEK ☐ MONTH ☐ QUARTER ☐ YEAR ☐ ____

G HAZARDOUS CHARACTERISTICS

REACTIVITY: ☐ NONE ☐ PYROPHORIC ☐ SHOCK SENSITIVE ☐ EXPLOSIVE ☐ WATER REACTIVE ☐ OTHER ____

OTHER HAZARDOUS CHARACTERISTICS

☐ NONE ☐ RADIOACTIVE ☐ ETIOLOGICAL

☐ PESTICIDE MANUFACTURING WASTE ☐ OTHER ____

USEPA HAZARDOUS WASTE? ☐ YES ☐ NO

USEPA HAZARDOUS CODE(S) ____ ____ ____ ____

STATE HAZARDOUS WASTE? ☐ YES ☐ NO

STATE CODE(S) ____

H SPECIAL HANDLING INFORMATION ____

____

____ ☐ ADDITIONAL PAGE(S) ATTACHED

I HEREBY CERTIFY THAT ALL INFORMATION SUBMITTED IN THIS AND ALL ATTACHED DOCUMENTS IS COMPLETE AND ACCURATE AND THAT ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED

AUTHORIZED SIGNATURE ____ TITLE ____ DATE ____

0400

ASSOCIATED BUSINESS FORMS INC (206) 367-9669

CHEM-SECURITY SYSTEMS, INC. Exhibit 7-7

NATIONAL RESPONSE CENTER **1-800-424-8802**
OREGON ACCIDENT RESPONSE CENTER **1-800-452-0311**

Please print or type
Form designed for use on elite (12-pitch) typewriter)

Form Approved OMB No 2000-0404 Expires 7-31-86

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of	Information in the shaded areas is not required by Federal law

3 Generator's Name and Mailing Address

4 Generator's Phone ( )

A. Gross:
B. Tare:
C. Net:

5 Transporter 1 Company Name	6. US EPA ID Number	**D. Transporter's Phone**
7 Transporter 2 Company Name	8. US EPA ID Number	**E. State Transporter's ID** **F. Transporter's Phone**
9 Designated Facility Name and Site Address **Chem-Security Systems, Inc.** **Star Route** **Arlington, Oregon 97812**	10. US EPA ID Number **ORD 089 452 353**	**G. State Facility's ID** **H. Facility's Phone** **503-454-2643**

11 US DOT Description (*Including Proper Shipping Name, Hazard Class, and ID Number*)	HM	12. Containers No.	12. Containers Type	13 Total Quantity	14 Unit Wt/Vol	**EPA/I. Waste No.**
a						
b						
c						
d						

J Additional Descriptions for Materials Listed Above
a.
b.
c.
d.

K. **WPS**			**Handling Code**			
			Cu. Yd.			
Area	**S**	**D**	**Q**	**PR**	**Lbs.**	
					Gal.	

15 Special Handling Instructions and Additional Information **Waste Profile Sheet Number(s)**
a.
b.
c.
d.

16 **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately decribed above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations

Unless I am a small quantity generator who has been exempted by statute or regulation from the duty to make a waste minimization certification under Section 3002(b) of RCRA, I also certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and I have selected the method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment

Printed/Typed Name	Signature	Date Month	Day	Year

G E N E R A T O R

17 Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date Month	Day	Year

18 Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date Month	Day	Year

T R A N S P O R T E R

19 Discrepancy Indication Space

20 Facility Owner or Operator Certification of receipt of hazardous materials covered by this manifest except as noted in item 19

Printed/Typed Name	Signature	Date Month	Day	Year

F A C I L I T Y

MODULE IIIa

LAND TREATMENT UNITS

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MODULE IIIa LAND TREATMENT UNITS

A. APPLICABILITY

The requirements of this Permit Module apply to the operation of the hazardous waste land treatment units at the facility. The Permittee must maintain a land treatment program in accordance with this permit, applicable requirements in Title 16, Chapter 44, ARM, and as specified in the Application.

B. PERMITTED WASTES

1. Hazardous Wastes

The Permittee may land treat the following hazardous wastes, subject to the terms of this permit:

EPA Hazardous Waste Number	Hazardous Waste
K051	* API separator sludge from the petroleum refining industry
K049	Slop oil emulsion solids from the petroleum refining industry

* At Exxon, K051 also contains heat exchanger bundle cleaning sludge, K050.

2. Non-hazardous Wastes

The Permittee may land apply the following non-hazardous refinery wastes, subject to the terms of this permit:

- asphaltic residues
- cooling tower sludge
- crude tankage bottoms
- intermediate tankage bottoms
- oxidation pond waste
- unleaded tankage product bottoms
- soil or gravel contaminated through spillage of petroleum products, residues, etc. Soils or gravels contaminated with wastes listed in Condition R. of this Module are prohibited from land treatment.

3. All wastes applied to the land treatment area are subject to the waste analysis requirements of Condition J.2. of this Module, and application is limited by the loading rates specified in Condition F.3. of this Module.

4. The Permittee shall not apply liquid wastes, including free liquids associated with any solid or sludge, containing metals at concentrations greater than concentrations shown in Attachment III.a.1. Attachment III.a.1. is adapted from the Hazardous and Solid Waste Act California list criteria, RCRA Section 3004(d)(2)(B).

5. The Permittee shall not knowingly apply metal-bearing wastes in concentrations which would exceed the in-soil limits specified in Attachment III.a.2.

C. PERMITTED PROCESS UNITS

1. The Permittee is entitled to operate a land treatment program for the wastes specified in Condition B of this Module, at the following designated areas at the Exxon Billings Refinery, Yellowstone County, Montana:

Unit Identification	Area	Location
New South Unit	6.1 ha (15.1 ac)	T.1N, R.26E, Section 25
New East Unit	2.8 ha (6.9 ac)	T.1N, R.27E, Section 19
Old East Unit	2.0 ha (4.9 ac)	T.1N, R.27E, Section 19 & T.1N, R.26E, Section 24

2. Attachments IIIa3 and IIIa4 show the land treatment areas at the Exxon Billings Refinery. The land treatment areas are all surfaces within the dikes established at the perimeter of each unit area.

3. Inclusion of the New East Unit and Old East Unit or portions of those units in the RCRA permit is subject to the special conditions outlined in Module VI. If the special conditions cannot be met by the date specified, the east units will be stricken from the permit and will be closed in accordance with Condition O. of this Module and Module V, Closure/Post-Closure.

D. PRINCIPAL HAZARDOUS CONSTITUENTS

The constituents listed in Attachment IIIa5, referred to throughout this Module as the principal hazardous constituents or PHCs, will be evaluated routinely in groundwater, soil pore liquid, and below treatment zone soils. These constituents have been selected from the modified Skinner list for refinery constituents, Attachment IIIa6. The PHCs are found in significant quantities in the permitted wastes, and provide a reliable indication of the presence of hazardous constituents in the environmental media listed above. In the event that PHCs are detected in environmental media, the Permittee may be required to analyze for the modified Skinner list of constituents. See Conditions K.2. and K.4. of this Module, and Module IV, Groundwater Monitoring.

E. HORIZONTAL AND VERTICAL DIMENSIONS OF THE TREATMENT ZONE

1. The treatment zone is the portion of the unsaturated zone below and including the land surface in which the conditions necessary for effective degradation, transformation, or immobilization are maintained. The horizontal dimensions of the treatment zone are the areas within the perimeter dikes shown with dashed lines in Attachments IIIa3 and IIIa4.

2. Wastes shall be applied only in a defined portion of the treatment zone, called the zone of incorporation (ZOI). As described on page 14-10 of the Application, the ZOI consists of a soil layer from the surface to a point 23 cm (9 inches) below the surface within the treatment zone.

3. The total depth of treatment zone in the New South Unit is 1.2 meters (4 feet). The total depth of the treatment zone in the Old East and the New East Units is variable and is listed on a sector by sector basis described below. Refer to Attachment IIIa7, which shows the land treatment unit sectors. (List TZ for east sectors.)

4. In no event shall the treatment zone be greater than 1.5 meters (5 feet), and in all sectors the maximum depth of the treatment zone must be a minimum of 1 meter (3 feet) above the seasonal high water table.

F. OPERATION OF THE LAND TREATMENT SYSTEM

1. General Requirements

a. The Permittee must operate and maintain the land treatment units to maximize the degradation, transformation, and immobilization of hazardous

constituents in the treatment zone. The units must be operated in accordance with the methods described in the Application and the Conditions contained in this Module.

b. The Permittee shall utilize a series of records identified in Condition N. of this Module to evaluate the operation of the land treatment units. Records shall be kept for each unit for all of the following: rate and method of waste application, testing and application to control pH, testing and application for nutrient addition, tillage, control of moisture and wind dispersal.

2. Method of Waste Application

a. The application season is generally April through October, depending on weather conditions. Wastes are collected in either vacuum trucks or dump trucks and are applied to designated land treatment sectors. Wastes collected in vacuum trucks are applied through a distribution manifold on the back of the truck. Wastes in dump trucks are dumped on the treatment unit and then spread with a bulldozer or tool bar.

b. No more than two applications a year shall be made on any sector. Applications shall be made first to those sectors with the lowest concentrations of oil and grease within the ZOI, as defined below.

3. Rate of Waste Application

a. Percent oil and grease, as determined by Method 9070 for water and wastewater samples, 9071 for sludges and solids, U.S. EPA SW-846 (1986), will define the rate limit (RL), and will define limiting conditions for applied

hazardous and non-hazardous waste. The rate limit is two-fold, with a limit for mass of freon extractable oil and grease (FE) applied per unit area per year, and a limit for weight percent FE found in the ZOI at any point in time. Neither requirement of the rate limit can be exceeded. The weight percent limit is high enough to allow for application and analytical variability. The limits are:

- 5 percent FE (dry weight), in soil samples taken from the 23 cm ZOI; and

- 70 metric tons FE/hectare/year, total for both hazardous and non-hazardous wastes, not to be exceeded in any unit.

b. The dry weight percent of freon extractable oil and grease in the ZOI shall be determined through monthly sampling of each sector during the application season, as described in Condition J.4. of this Module.

c. The Permittee shall demonstrate annually, compliance with the rate limit of 70 metric tons FE/hectare/year in each land treatment unit by the following method:

Prepare a table similar to Attachment IIIa8. List all hazardous and non-hazardous wastes applied during the calendar year, the mass of each waste applied based on operating records, the application weighted average of the weight percent FE for each waste applied based on waste analysis records, and the mass of FE applied for each waste. The total mass of FE applied during the year is divided by the total land area used to demonstrate compliance with the rate limit.

d. The Permittee shall demonstrate on an annual basis, beginning in 1988, and at closure, that the metals criteria shown in Attachment IIIa2 are not being exceeded in the 23 cm ZOI. Sampling and analysis shall be conducted in accordance with Condition L. of this Module. If the criteria in Attachment IIIa2 are exceeded, the Permittee may only place wastes on the unit area(s) for which the metals concentrations are less than or equal to the in-soil concentration limits.

4. Measures to Control Soil pH

a. Hazardous and non-hazardous wastes shall be measured for pH at the frequency described in Condition J.2. of this Module. In no event shall a waste be applied which has a pH of less than 5 or greater than 11.

b. The Permittee shall measure soil pH in the 23 cm ZOI as described in paragraph 3 of Attachment IIIa9. Samples are to be collected annually, in the spring.

c. The average pH in the ZOI in all treatment areas shall be maintained between 6.5 and 9.0, with a target pH of 7.0. The Permittee shall determine the amount of lime needed to increase soil pH, if testing shows that it is necessary, according to the method described in paragraph 4 of Attachment IIIa9.

5. Nutrient Addition

The Permittee shall collect samples annually as described in paragraph 3 of Attachment IIIa9, in order to determine the fertilizer needs in the land treatment units. The soil shall be analyzed in accordance with procedures described in paragraph 1 of Attachment IIIa10. Nutrients will be maintained at the following levels:

340 Kg/hectare as N
45 Kg/hectare as P
225 Kg/hectare as K

Fertilization will be accomplished as described in paragraphs 2, 3, and 4 of Attachment IIIa10.

6. Tillage

a. The Permittee shall utilize tilling of the ZOI portion of the treatment zone to enhance microbial degradation of the applied wastes.

b. All active portions of the land treatment units will be tilled at least monthly, even those areas which have not received waste in the previous month. Tillage will be performed as described in paragraph 5 of Attachment IIIa9.

c. The Permittee shall perform tillage at those times which can optimize treatment and minimize wind dispersal. The Permittee shall ensure that tilling operations do not result in unnecessary pulverization of the soil surface resulting in airborne dispersal of wastes and soils during dry periods and under excessively windy conditions.

7. Measures to Control Soil Moisture in the Treatment Zone

Moisture content in the treatment zone will be controlled as necessary to maximize waste degradation, while minimizing unnecessary blowing of wastes and surficial soils. Soil moisture is controlled as described in paragraph 5 of Attachment IIIa10, where wastes may be applied at higher aerial loading rates during arid periods as long as loading

rates are not exceeded. This will mitigate excessive drying, which could cause blowing materials or could retard microbial activity.

8. Control of Wind Dispersal

The Permittee shall ensure that airborne dispersal of wastes and surficial soils will be kept to a minimum. Tillage shall be avoided during excessively dry or windy periods. The Permittee shall note in the operating record incidents of blowing soils or wastes, and document efforts made to control wind dispersal.

G. RUN-ON AND RUN-OFF CONTROL SYSTEMS

1. The Permittee shall operate and maintain dike systems around each permitted land treatment unit that will:

   a. prevent run-on flow onto the treatment zone during peak discharge from a 24-hour, 25-year storm. For run-on control, drainage swales may also be required;

   b. collect and control run-off resulting from at least the water volume resulting from a 24-hour, 25-year storm.

2. By December 1, 1988, the Permittee shall submit to the Department a report evaluating the run-on and flooding potential of upgradient drainages on the East Land Farm Units.

3. The land treatment unit dikes are constructed as shown in Attachment IIIa11, and are located as indicated by dashed lines in Attachments IIIa3 and IIIa4.

4. The dike systems shall be inspected weekly and after storms, and must be maintained for the life of the facility.

5. The Permittee shall perform repairs or maintenance as necessary to ensure that dike heights and performance are maintained. Repairs are to be made within one week of the time damage is noted.

H. INSPECTION OF LAND TREATMENT FACILITIES

1. The Permittee shall follow the schedule of inspection for the land treatment units as established in the application and shown in Attachment IIIa12. Additionally, dikes shall be inspected after significant storms to check for erosion, leakage, or deterioration.

2. The inspection checklist shown in Attachment IIIa13 shall be followed. Fencing, dikes, warning signs, quadrant markers, lysimeters, and monitor wells shall be included in the inspection.

3. Unusual conditions such as ponded water or wind blown soils, if present, shall be noted on the inspection log.

4. All inspection activities shall be noted and made part of the operating record.

I. FOOD CHAIN CROPS

1. No crops or commercial forage shall be grown on land at this facility used for the treatment of hazardous wastes.

2. The notation on the deed, which is shown in Attachment IIIa14 shall be amended within thirty days of Permit issuance to state:

   a. Refinery wastes containing lead, chromium, cadmium, and other hazardous constituents have been disposed of at the land treatment units;

b. Food-chain crops must not be grown on those areas except in compliance with 40 CFR Section 264.276(b), as incorporated by reference in ARM 16.44.702.

J. LAND TREATMENT MONITORING REQUIREMENTS

1. General Requirements

a. The Permittee shall follow a regular schedule of monitoring as shown on Attachment IIIa15, and as described in Module IV, for applied wastes, soils in the ZOI, soil pore liquids, soils below the treatment zone, and groundwater.

b. The Permittee shall follow the evaluation requirements established in Condition K. of this Module.

c. All monitoring involving collection and analysis of samples shall follow the methods and procedures established in Condition L. of this Module, and Module IV. All monitoring data collected under the terms of this permit shall meet the criteria established for quality assurance and quality control measures required under Condition L. of this Module.

d. Results of all land treatment monitoring activities shall be noted and maintained in the operating record.

2. Waste Analysis

Hazardous and non-hazardous wastes will generally be sampled and analyzed in accordance with the waste analysis plan, described in Chapter 4 of the Application. The conditions listed below are exceptions to, or in addition to, that waste

analysis plan. All waste analyses shall be kept as part of the operating record.

a. Hazardous Wastes

Representative composite samples of listed hazardous wastes K049 (slop oil emulsion solids) and K051 (API separator sludge) shall be analyzed every other year, beginning in 1988 for the modified Skinner list constituents shown in Attachment IIIa6. If there are major changes in processes or raw materials that could affect waste quality, the Permittee shall notify the Department. Waste analysis for the constituents listed in Attachment IIIa6 will then be required within 60 days of the change.

Representative composite samples of K049 and K051 wastes must be analyzed as they are generated during the land application season, for the parameters listed in Attachment IIIa15.

After this Permit is in effect for two calendar years, the Department may consider a request from the Permittee for a minor Permit modification, to decrease the frequency of waste analysis, based on consistency of the analytical results.

b. Non-Hazardous Wastes

A representative sample of each non-hazardous waste listed under Condition B. of this Module that is land applied must be analyzed for the parameters listed in Attachment IIIa16, with the following exceptions:

- oil and grease analysis is not required for cooling tower sludge;
- EP Toxicity analysis is optional;
- metals scan must include all metals in Attachment IIIa1.

3. Soil-Pore Liquid Monitoring

The Permittee has two stainless steel pan lysimeters installed in the New South Land Treatment Unit, one in a background area near the New South Unit, and six in the New and Old East Land Treatment Units, as shown in Attachments IIIa17 and IIIa18. The lysimeters have been constructed according to the details shown in Attachment IIIa19, and established at the depths listed in Attachment IIIa20. The Permittee shall sample the lysimeters and provide analysis in accordance with pages 14-13 to 14-14 in the Application, with the exceptions and additions noted below:

a. All lysimeters will be checked for samples at least monthly during the application season, and following significant waste applications or precipitation events.

b. Analysis of two samples a year from each lysimeter is required. Collection of a spring sample and a fall sample is preferred, although weather conditions and waste application practices will be a factor in sample availability.

c. Each time a sample is collected from a lysimeter, its volume will be measured and recorded. If a lysimeter is checked and the Permittee determines that there is insufficient volume for analysis, the volume must still be measured and noted.

d. The analyses required for soil pore liquid samples are listed in Attachment IIIa5. In the event that there is insufficient sample volume for analysis of all parameters, the volatile organics will be analyzed first, followed by the semi-volatile organics, metals, pH, and specific conductance.

e. The Permittee shall install additional lysimeters as necessary within 60 days, to maintain the established number of lysimeters whenever an individual lysimeter is damaged or ceases to function. All new installations will be completed below the treatment zone, as specified in 40 CFR 264.278, as incorporated by reference in ARM 16.44.702. The lysimeter network must continue to represent the background soil-pore liquid unaffected by leakage from the land treatment units for the background lysimeter, and the quality of soil-pore liquid within or below the treatment zone for the other lysimeters.

4. Zone of Incorporation (ZOI) Soil Core Monitoring

a. Oil and Grease Analysis

i. Sampling and analysis of the 23 cm ZOI shall be done for FE oil and grease, determined as described in Condition L. of this Module.

ii. A composite sample, composed of a minimum of five randomly selected subsamples, shall be collected from each sector shown in Attachment IIIa7 monthly during the application season, and each spring before the application season begins. A minimum of six samples a year shall be collected from each sector.

iii. Documentation of the sampling and results of the analyses shall be noted and incorporated into the operating record.

b. Nutrient and pH Analysis

i. Composite samples shall be collected annually for pH and nutrient analysis. The results of the analyses will be used to control pH and determine fertilizer requirements, as described in Conditions F.4. and F.5. of this Module.

ii. Each spring, at least three composite soil samples will be collected from each land treatment unit.

iii. The composite samples will be collected as described in Attachment IIIa9, and will be composed of ten subsamples. The samples will be analyzed for pH, available nitrogen, phosphorous, and potassium as described in Attachments IIIa9 and IIIa10.

c. Metals Analysis

A portion of each composite sample collected for pH and nutrient analysis in Condition J.b. above, must be analyzed for the metals shown in Attachment IIIa2. These analyses are done in order to satisfy the requirements for metals loading under Condition F.3.d. of this Module.

5. Below Treatment Zone Soil Core Monitoring

a. Annual sampling will be required to monitor below treatment zone (BTZ) soil quality.

b. Randomly selected, uncomposited BTZ samples must be collected by the Permittee in the following numbers:

i. New South Unit	5
ii. New East Unit	6
iii. Old East Unit	4
Total	15

c. The analytical parameters for which each uncomposited sample must be analyzed are listed in Attachment IIIa5.

d. The soil cores will be taken to a depth of the treatment zone plus 15 cm, using sampling methods described in Condition L. of this Module.

6. Groundwater Monitoring

Groundwater monitoring for the land treatment units will be conducted according to the information presented in Module IV, Groundwater Monitoring.

K. MONITORING EVALUATIONS

1. Waste Analysis Evaluation

Biannual analyses of listed wastes K049 and K051 shall be reviewed by the Permittee and compared to previous analyses. Appearance of hazardous constituents not previously detected in those wastes shall be noted. If previously undetected constituents appear in significant concentrations, the Permittee shall review and evaluate the list of PHCs described in Condition D. of this Module to determine if the PHCs continue to represent the hazardous constituents of the applied wastes.

2. Soil-Pore Liquid Monitoring Evaluation

a. For the organic constituents listed in Attachment IIIa5, the following evaluation method is outlined:

   i. If one or more organic constituent is found in any lysimeter sample from a treatment zone or BTZ lysimeter, then the Department must be notified within fifteen days of receipt of the analytical information by the Permittee. Within thirty days of receiving the analytical information, the Permittee must re-sample the lysimeter.

   ii. Re-sampling is necessary only at the lysimeter or lysimeters that show concentrations above detection and only for those constituents detected.

   iii. If a lysimeter sample cannot be collected within thirty days of receipt of the initial analyses by the Permittee, because of dry conditions, then the lysimeter shall be checked weekly until a sample is available.

   iv. If the repeat sampling indicates appearance of at least one constituent, then the Department shall be notified within fifteen days of receipt of the analytical results by the Permittee. Another sample shall then be taken immediately at the lysimeter or lysimeters for Skinner list constituents shown in Attachment IIIa6.

   v. During this period, the Permittee may investigate the possibility that a source other than the land treatment unit is causing the appearance of the hazardous constituents, or that the results represent an error in sampling, analysis, or evaluation.

vi. If Skinner list analysis indicates a third instance of concentrations of organic hazardous constituents above the detection limit, this is considered a statistically significant increase. The Permittee shall notify the Department of the finding within seven days. The notification must indicate what constituents have shown statistically significant increases.

vii. Within 90 days, the Permittee shall submit an application for a permit modification to modify the operating practices at the land treatment unit or units in order to maximize the success of degradation, transformation, or immobilization processes in the treatment zone.

viii. If organic hazardous constituents appear in both background and land treatment unit lysimeters during the same sampling event, a statistical procedure as described under 40 CFR 264.280(d)(3), as incorporated by reference in ARM 16.44.702, will be used to determine statistical significance. Statistically significant concentrations will require the notification and response procedures outlined in vi and vii above.

ix. Lead and chromium concentrations in land treatment unit lysimeter samples will be evaluated by comparison to background concentrations, using a statistical procedure as described under 40 CFR 264.280(d)(3), as incorporated by reference in ARM 16.44.702. Statistically significant concentrations will require the notification and response procedures outlined in vi and vii above.

3. Zone of Incorporation Soil Monitoring Evaluation

   a. See Condition J.4.a. of this Module. FE oil and grease analytical results will be evaluated monthly during the application for each sector, to verify that the 5% dry weight basis application limit is not being exceeded.

   b. See Condition J.4.b. of this Module. Results of pH and nutrient analysis will be evaluated annually to determine the liming and fertilizer requirements of each land treatment unit, as described in conditions F.4. and F.5. of this Module.

   c. See Condition J.4.c. of this Module. Results of the metals analyses will be evaluated annually to verify that the metals criteria shown in Attachment IIIa2 are not being exceeded.

4. Below Treatment Zone Soil Monitoring Evaluation

   a. See Condition J.5. of this Module. For the organic constituents listed in Attachment IIIa5, the following evaluation method is outlined:

      i. If one or more organic constituent is found in any BTZ soil core, the Department must be notified within fifteen days of receipt of the analytical information by the Permittee. Another core must be taken from the same quarter sector from which the first core was sampled, within thirty days of the Permittee receiving the analytical information.

      ii. Re-sampling is necessary only for the core or cores that show concentrations above detection and only for those constituents detected.

iii. If the repeat sampling indicates appearance of at least one constituent, then the Department must be notified within fifteen days of receipt of the analytical information by the Permittee. Another sample shall be taken immediately, near the original cores, for Skinner list constituents shown in Attachment IIIa6.

iv. During this period, the Permittee may investigate the possibility that a source other than the land treatment unit is causing the appearance of the hazardous constituents, or that the results represent an error in sampling, analysis, or evaluation.

v. If Skinner list analysis indicates a third instance of concentrations of organic hazardous constituents above the detection limit, this is considered a statistically significant increase. The Permittee shall notify the Department of the finding within seven days. The notification must indicate what constituents have shown statistically significant increases.

vi. Within 90 days, the Permittee shall submit an application for a permit modification to modify the operating practices at the land treatment unit or units in order to maximize the success of degradation, transformation or immobilization processes in the treatment zone.

vii. Lead and chromium concentrations in land treatment unit BTZ soil samples will be evaluated by comparison to background concentrations, established during the land treatment demonstration. The Permittee will use

a statistical procedure as described under 40 CFR 264.280(d)(3), as incorporated by reference in ARM 16.44.702. Statistically significant concentrations will require the notification and response procedures outlined in v and vi above.

5. Groundwater Monitoring Evaluation Groundwater monitoring evaluation for the land treatment units will be conducted according to the information presented in Module IV, Groundwater Monitoring.

L. SAMPLING AND ANALYTICAL METHODS

1. Sampling Methods

a. General Requirements

i. All samples are to be collected in accordance with methods outlined in Test Methods for Evaluating Solid Wastes, Physical Chemical Methods, EPA 1986 (SW-846), or as otherwise specified in this Permit.

ii. All samples will be iced or preserved as specific analytical methods dictate, at the time of collection and during transport to the laboratory. A chain-of-custody from the field to the laboratory must be maintained and documented, as discussed in Appendix 14.1 of the Application. Attachment IIIa21 is a sample chain-of-custody form.

iii. Where random soil samples are required, the sample sites will be selected in accordance with the information in Attachment IIIa22.

iv. All sampling equipment must be precleaned and decontaminated between samples as required.

v. Records of all sampling methods and events shall be incorporated into the operating record.

b. Waste Sampling

The Permittee must ensure that representative waste samples are obtained. Sampling methods described in 40 CFR Part 261, Appendix I, SW-846, or comparable methods must be used.

c. Soil-Pore Liquid Sampling

Soil-pore liquid samples are to be collected from stainless steel pan lysimeters, described under Condition J.3. of this Module. All lysimeters must be checked visually for sample availability at lease once a month during the application season.

d. Zone of Incorporation Soil Sampling

ZOI soil samples are collected using a 2 cm diameter soil sampling tube. The top 23 cm of soil in each core is selected. Depending on the parameters to be analyzed, a number of individual core samples are placed in a bucket and thoroughly mixed to form one composite sample.

e. Below Treatment Zone Soil Sampling

Randomly selected BTZ cores are taken from a depth of the treatment zone plus 15 cm, using a Shelby tube, split spoon, or other appropriate sampler. After taking the sample, each core hole is to be backfilled with bentonite

to prevent migration of waste constituents below the treatment zone.

f. Groundwater Sampling

Groundwater sampling is to be conducted in accordance with the methods outlined in Module IV, Groundwater Monitoring.

2. Analytical Methods

a. Attachments IIIa23 and IIIa24 list all applicable test methods to be used in the land treatment monitoring program, except for soil pH and soil nutrient analyses. These methods are outlined in Attachments IIIa9 and IIIa10.

b. Analytical reports shall contain the following information:

- analytical methods used
- detection limits
- quality control information pertinent to the analysis involved (spikes, duplicates, blanks, etc.)
- laboratory used

c. The Permittee shall ensure that all laboratory analyses undertaken as part of this permit contain adequate quality control and quality assurance. The laboratory must be capable of evaluating quality control procedures as specified in SW-846. The laboratory must also have quality control and backup information available for specific analyses, which can be accessed if necessary.

d. Analytical results shall be incorporated into the operating record.

M. REPORTING REQUIREMENTS

1. Annually, by April 1, the Permittee shall submit to the Department a brief report for the previous calendar year which documents that the rate limit (RL) established for freon extractable oil and grease under Condition F.3. of this Module has not been exceeded. The report shall summarize both the results of the ZOI sampling for FE oil and grease, discussed in Condition F.3.b., and the analysis of metric tons/hectare/year FE oil and grease applied as outlined in F.3.c.

2. Annually, by April 1, the Permittee shall submit to the Department a brief report that documents compliance with the metals loading criteria outlined in F.3.d. during the previous calendar year.

3. Annually, by April 1, the Permittee shall submit to the Department laboratory reports of soil pore liquid monitoring outlined in Condition J.3. of this Module, and below treatment zone soil core monitoring, outlined in Condition J.5. of this Module, for the previous calendar year. If organic hazardous constituents are detected in lysimeter samples or BTZ soil cores, then additional notification and evaluation procedures will be required, as outlined in Condition K.2. and K.4. of this Module.

4. Reporting requirements for groundwater monitoring are described in Module IV, Groundwater Monitoring.

N. RECORDKEEPING

1. The Permittee shall keep written records of the following land treatment unit activities:

Category	Records to be Kept
Waste Applications	- Types of wastes applied, both hazardous and non-hazardous - Waste volumes - Application dates - Areas to which wastes are applied - Waste sampling and analytical records - Evaluations/calculations of wastes application rates and loading
Land Treatment Unit Operations	- Tillage dates, areas - Nutrient and pH control application dates and amounts - Any activities taken to control wind dispersal or ponding on land treatment units - Records of all routine inspections - Monitoring records including sampling logs or notes, analytical results, evaluations, and required reports for wastes, ZOI and BTZ soils, lysimeter samples, and groundwater samples
Other Documents	- Valid permit - Closure plan and closure cost estimates (as updated or revised) - Copies of requests for permit modifications or changes in practices or procedures

2. All records required under this Condition must be furnished upon request, and made available at all reasonable times for inspection, by any duly designated representative of the Department.

O. CLOSURE AND POST-CLOSURE REQUIREMENTS

1. Closure Performance Standards

The Permittee shall close the land treatment units in accordance with the closure plan shown in Attachment IIIa25, with the following exceptions/additions, which are closure performance standards for in-place closure:

a. Normal operating procedures as described in Condition O.2. below shall be followed for a minimum of one year after receipt of the last load of wastes to allow for degradation, without placement of topsoil or a vegetative cover.

b. At the end of one year, the following composite ZOI soil samples will be collected and analyzed for the constituents shown in Attachment IIIa5, and for Ames assay or Microtox analysis.

Closure Sampling - ZOI Samples

Area	Composite Number	Subsamples randomly selected from these sectors
New South Unit	1	1, 3, 5
New South Unit	2	7, 9, 11, 13
New South Unit	3	2, 4, 6, 8
New South Unit	4	10, 12, 14
New East Unit	5	25, 26, 27
New East Unit	6	31, 32, 33, 37, 38
Old East Unit	7	15 - 22

c. The metals criteria shown in Attachment IIIa2 shall not be exceeded, as demonstrated in the ZOI sampling.

d. Detection limits for organic constituents must be at least as low as those used for ZOI soils in the land treatment demonstration.

e. If the concentrations of organic hazardous constituents are non-detectable in the ZOI for any land treatment unit, then closure, including placement of topsoil and seeding, can proceed at that unit.

f. If organic hazardous constituents are detected in the ZOI at the end of the first year then normal operating procedures including tillage, nutrient, and pH control, will continue for another year. ZOI sampling as described in (b) above will be conducted at the end of the second year.

g. If second year sampling shows non-detectable organics in the ZOI, or if there is no change in parameter concentrations of + 20%, including toxicity as measured by Microtox or Ames assay, between the first and second year sampling, then closure can proceed. If neither criterion is met, operational activities must continue for another year.

h. If neither criterion in (g) above is met after five years, the Permittee may begin final closure.

2. Closure Period

During the closure period, the Permittee shall:

a. Submit to the Department by October 7, 1988, an updated closure plan to include, but not limited to:

i. A report on the investigative activities performed since 1986 to determine the extent of below treatment zone soil contamination in areas of the Old East and New East Land Treatment Units.

ii. An estimate of the a real and vertical extent of contamination.

iii. A plan for removal and treatment of "hot spot" soils.

iv. An evaluation of the potential for long-term impacts due to migration of hazardous constituents below the treatment zone.

v. A schedule outlining when the corrective activities will be implemented and completed.

b. Continue all operations specified in this permit necessary to maximize degradation, transformation, or immobilization of hazardous constituents within the treatment zone, including tillage and nutrient and pH control, except to the extent they are inconsistent with Condition O.2.g. of this Module;

c. Continue all operations in the treatment zone to minimize run-off of hazardous constituents, including maintenance of the runoff management diking system required under the terms of this permit as specified in Conditions G.1.b., G.2., G.3., and G.4. of this Module;

d. Maintain the run-on management system required under the terms of this permit, specifically the diking system specified in Conditions G.1.a., G.2., G.3., and G.4. of this Module;

e. Control wind dispersal of hazardous waste as required in Condition F.8. of this Module;

f. Continue to comply with prohibitions and conditions concerning growth of food chain crops under Condition I. of this Module;

g. Continue unsaturated zone monitoring in compliance with Conditions J.3. and J.5. of this Module, except that soil-pore liquid monitoring may be terminated not less than 90 days following the last application of waste to specific land unit areas. All unit areas having received waste under this permit shall continue to be evaluated; and

h. Establish a vegetative cover as described in Attachment IIIa25 on the portion of the land treatment area(s) being closed at such time that the cover will not substantially impede degradation, transformation, or immobilization of hazardous constituents in the treatment zone. The criteria outlined in Conditions O.1.e., O.1.g., or O.1.h. of this Module must be met before a vegetative cover is established. The vegetative cover must be capable of maintaining growth without extensive maintenance including the need for supplemental irrigation;

i. The Permittee may propose modification of the current closure plan in writing to the Department at any time prior to within two months of notification of closure. The Department may require modifications to the existing or modified closure plan, and shall notify the Permittee in writing.

j. The Permittee shall maintain the necessary financial assurance arrangements to carry out closure and post-closure activities.

3. Post-Closure Period

When the closure period has been completed in compliance with Condition O.2. of this Module, the Permittee shall submit to the Department certification by an independent qualified soil scientist, in lieu of an independent registered professional engineer, that the facility has been closed in accordance with the specifications in the approved closure plan and this permit. During the post-closure care period, the Permittee must:

a. Continue all operations of this permit necessary to maximize degradation, transformation, or immobilization of hazardous constituents within the treatment zone, to the extent they are consistent other post-closure activities below.

b. Maintain the vegetative cover over closed portions of the facility as required under Condition O.2.g. of this Module.

c. Continue all operations in the treatment zone to minimize run-off of hazardous constituents, including maintenance of the runoff management diking system required under the terms of this permit as specified in Conditions G.1.b., G.2., G.3., and G.4. of this Module.

d. Maintain the run-on management system required under the terms of this permit, specifically the diking system specified in Conditions G.1.a., G.2., G.3., and G.4. of this Module.

e. Control wind dispersal of hazardous waste as required in Condition F.8. of this Module.

f. Continue to comply with prohibitions and conditions concerning growth of food chain crops under Condition I. of this Module.

g. Continue unsaturated zone monitoring in compliance with Condition J.5. of this Module. All unit areas having received waste under this permit shall continue to be evaluated. Below treatment zone soils will continue to be monitored, but with a decreasing frequency, during the post-closure period:

  - at time of vegetation
  - six months after vegetation is established
  - one year after vegetation is established
  - two years after vegetation is established
  - four years after vegetation is established
  - eight years after vegetation is established
  - sixteen years after vegetation is established
  - thirty years after vegetation is established

  During the post-closure period, the Department may decide that more frequent below treatment zone soil monitoring is necessary, at which time the Department will notify the Permittee in writing. Examples of conditions that could warrant more frequent BTZ sampling would be the appearance of hazardous constituents in groundwater immediately downgradient of the land treatment units or inadvertent damage to the vegetative cover.

h. The Permittee shall no longer be subject to Conditions O.2.f. and O.3.g. of this Module at such time as the Permittee can demonstrate to the Department that the level of hazardous constituents, including metals, in the treatment zone soil does not exceed the background value of those constituents by an amount that is statistically

significant when using a test as specified in 40 CFR 264.280(d)(3), as incorporated by reference in ARM 16.44.702.

i. The post-closure care period shall extend for 30 years, unless the post-closure plan is amended through a permit modification, as specified in 40 CFR 264.118 (d), as incorporated by reference in ARM 16.44.702.

P. SPECIAL REQUIREMENTS FOR IGNITABLE OR REACTIVE WASTES

1. The Permittee must not apply ignitable or reactive wastes to the treatment zone unless the waste is immediately incorporated into the soil so that the resulting waste/soil mixture or dissolution of the material no longer meets the definition of ignitable or reactive waste under ARM 16.44.321 or ARM 16.44.323.

2. The waste is managed in such as way that it is protected from any material or conditions which may cause it to ignite or react.

Q. SPECIAL REQUIREMENTS FOR INCOMPATIBLE WASTES

1. The Permittee must not place incompatible wastes, or incompatible wastes and materials, in or on the same treatment zone, unless 40 CFR 264.17, as incorporated by reference in ARM 16.44.702, is complied with.

R. SPECIAL REQUIREMENTS FOR HAZARDOUS WASTES PROHIBITED FROM LAND DISPOSAL

1. EPA Hazardous Waste Numbers F001, F002, F003, F004, F005, F020, F021, F022, F023, F026, and F027, and soils or gravels that have been contaminated by these wastes, are prohibited from placement in the land treatment units.

Attachments
Module IIIa
Land Treatment Units

List of Attachments
Module IIIa -- Land Treatment Units

IIIa1	Concentration Limits for Metals in Liquid Wastes Applied to Land Treatment Units
IIIa2	Metals Exceedance Criteria
IIIa3	Topographic Map, New South Land Treatment Unit
IIIa4	Topographic Map, East Land Treatment Units
IIIa5	Principal Hazardous Constituents for Exxon Land Treatment Units
IIIa6	Modified "Skinner List" of Hazardous Constituents Found in Refinery Wastes
IIIa7	Land Treatment Unit Sectors
IIIa8	Table 14.8, Determination of Composite Waste
IIIa9	P. 14-11, pH Control and Tillage
IIIa10	p. 14-12, Nutrient Addition and Moisture Control
IIIa11	p. Figure 14.8, Cross Section of Typical Land Treatment Unit Dike
IIIa12	Table 5-1, Inspection Checklist
IIIa13	Exhibit 5-7, Inspection Checklist
IIIa14	Appendix 11.1, Notation in Deed
IIIa15	Land Treatment Operational Monitoring Schedule
IIIa16	Table 4.2, Waste Analysis to Determine Suitability
IIIa17	Figure 14.2, New South Land Treatment Unity Lysimeter Locations
IIIa18	Figure 14.3, East Land Treatment Unit Lysimeter Location
IIIa19	figures 14.4 and 14.5, Lysimeter Construction Details
IIIa20	Table 14.13, Spatial Relationship, Lysimeter Pans
IIIa21	Appendix 14.I, Sample Chain-of-Custody Record
IIIa22	Appendix 14.III, Random Sampling Procedure
IIIa23	Table 4-3, Test Methods
IIIa24	Table 14.3, Analytical Procedures
IIIa25	p. 11-9 to 11-14, Closure and Post-Closure Plans

Concentration Limits for Metals in Liquid Wastes Applied to Land Treatment Units

(i) Arsenic and/or compounds (as As) 500 mg/1;

(ii) Cadmium and/or compounds (as Cd) 100 mg/1;

(iii) Chromium (VI) and/or compounds (as Cr VI) 500 mg/1;

(iv) Lead and/or compounds (as Pb) 500 mg/1;

(v) Mercury and/or compounds (as Hg) 20 mg/1;

(vi) Nickel and/or compounds (as Ni) 134 mg/1;

(vii) Selenium and/or compounds (as Se) 100 mg/1; and

(viii) Thallium and/or compounds (as T1) 130 mg/1.

Adapted from the Hazardous and Solid Waste Act California list criteria, RCRA Section 3004(d)(2)(B).

METALS EXCEEDANCE CRITERIA

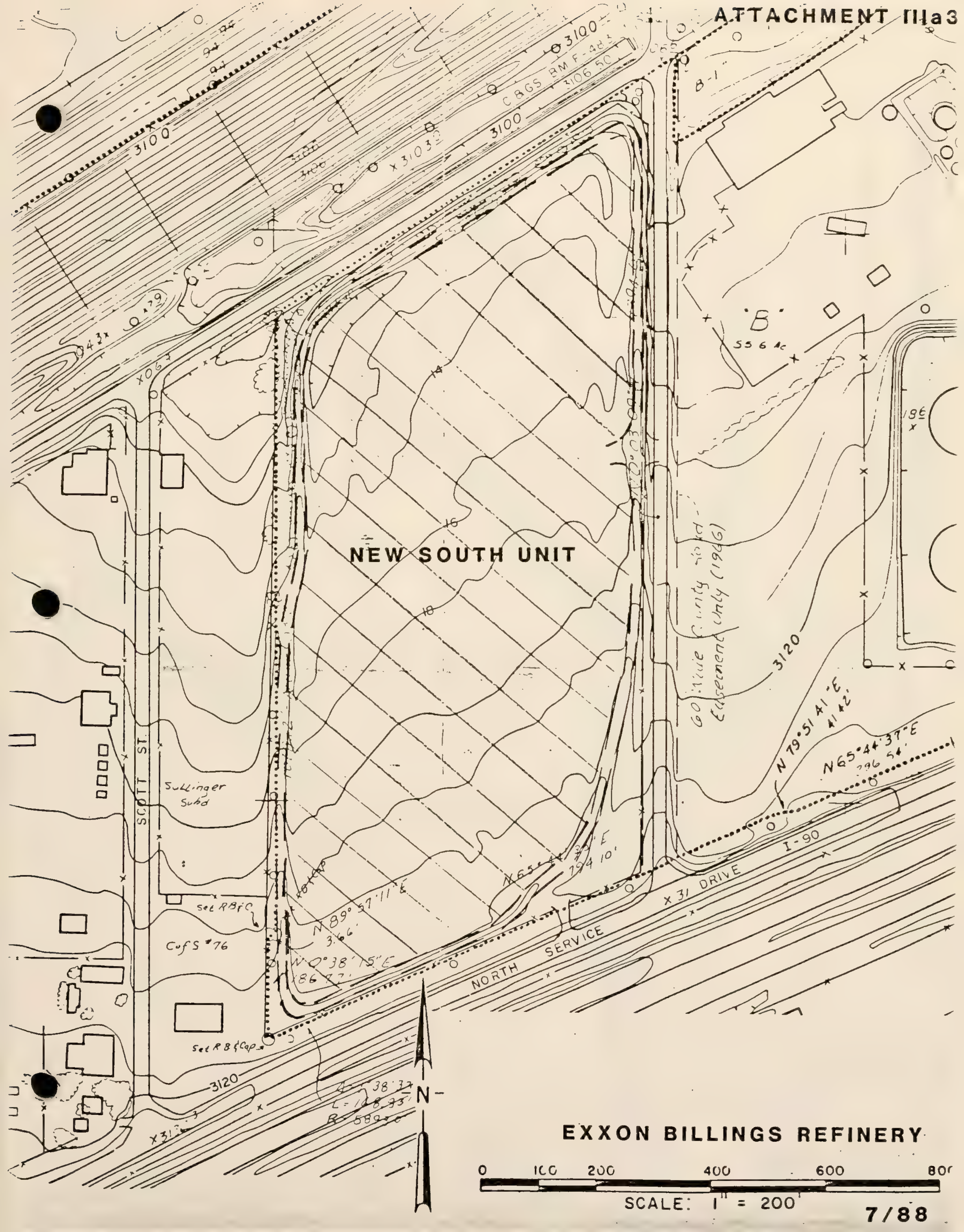
Parameter	Maximum Allowable Levels
Antimony	1000 ppm[1]
Arsenic	300 ppm[1]
Barium	2000 ppm[1]
Beryllium	50 ppm[1]
Cadmium	10 ppm[2]
Chromium	1000 ppm[1]
Cobalt	200 ppm[1]
Copper	500 ppm[2]
Lead	1000 ppm[1]
Mercury	20 ppm[1]
Nickel	100 ppm[1]
Selenium	20 ppm[3]
Vanadium	500 ppm[1]
Zinc	500 ppm[1]

[1] Values established from SW-874, Land Treatment Manual, EPA, 1983, based on recommended upper limits for agriculture

[2] Values established at upper limit of native soils range, SW-874

[3] Value established at 2x current detection limit

ATTACHMENT IIIa3

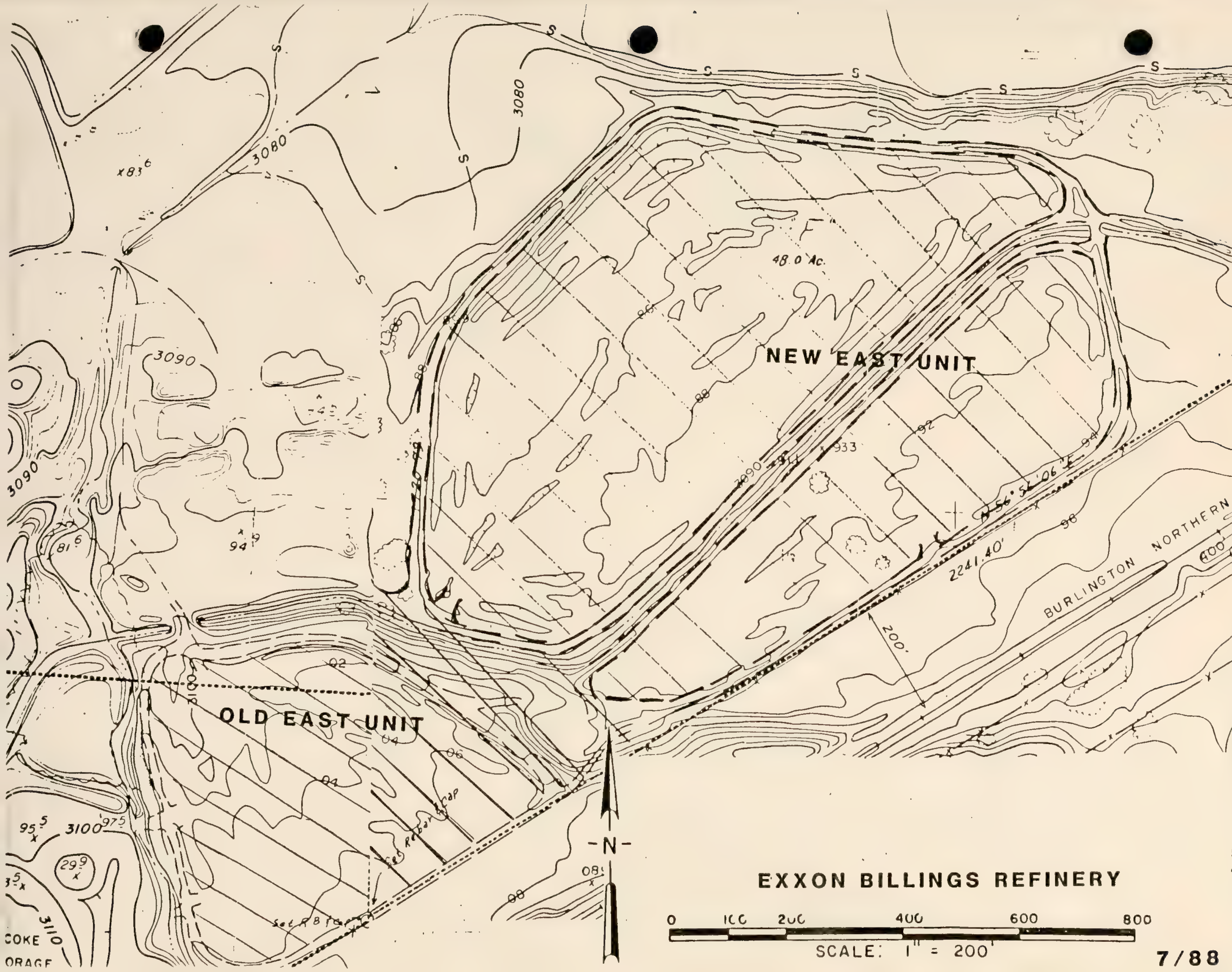


EXXON BILLINGS REFINERY

SCALE: 1" = 200'

7/88

ATTACHMENT IIIa4



EXXON BILLINGS REFINERY

7/88

ATTACHMENT IIIa 5

Principal Hazardous Constituents
for
Exxon Land Treatment Units

Organics

Volatiles

- toluene
- xylene

Semi-volatile Base/Neutral

- 1-methyl naphthalene
- naphthalene
- phenanthrene

Semi-volatile Acid-Extractable

- 2-4-dimethylphenol

Metals

- lead
- chromium

Other

- pH*
- specific conductance*

(lysimeter samples only)

To be evaluated routinely in soil-pore liquid and below treatment zone soils.

* Although these parameters are to be evaluated routinely, their variation or change will not be interpreted as indicating the presence of hazardous constituents.

Modified "Skinner List" for Hazardous Constituents in Petroleum Refining Wastes

1. Metals

   - Antimony
   - Arsenic
   - Barium
   - Beryllium
   - Cadmium
   - Chromium
   - Cobalt
   - Lead
   - Mercury
   - Nickel
   - Selenium
   - Silver
   - Vanadium

2. Volatiles

   - Benzene
   - Carbon disulfide
   - Chlorobenzene
   - Chloroform
   - 1,2-Dichloroethane
   - 1,4-Dioxane
   - Ethyl benzene
   - Ethylene dibromide
   - Methyl ethyl ketone
   - Styrene
   - Toluene
   - Xylene

3. Semi-volatile Base/Neutral Extractable Compounds

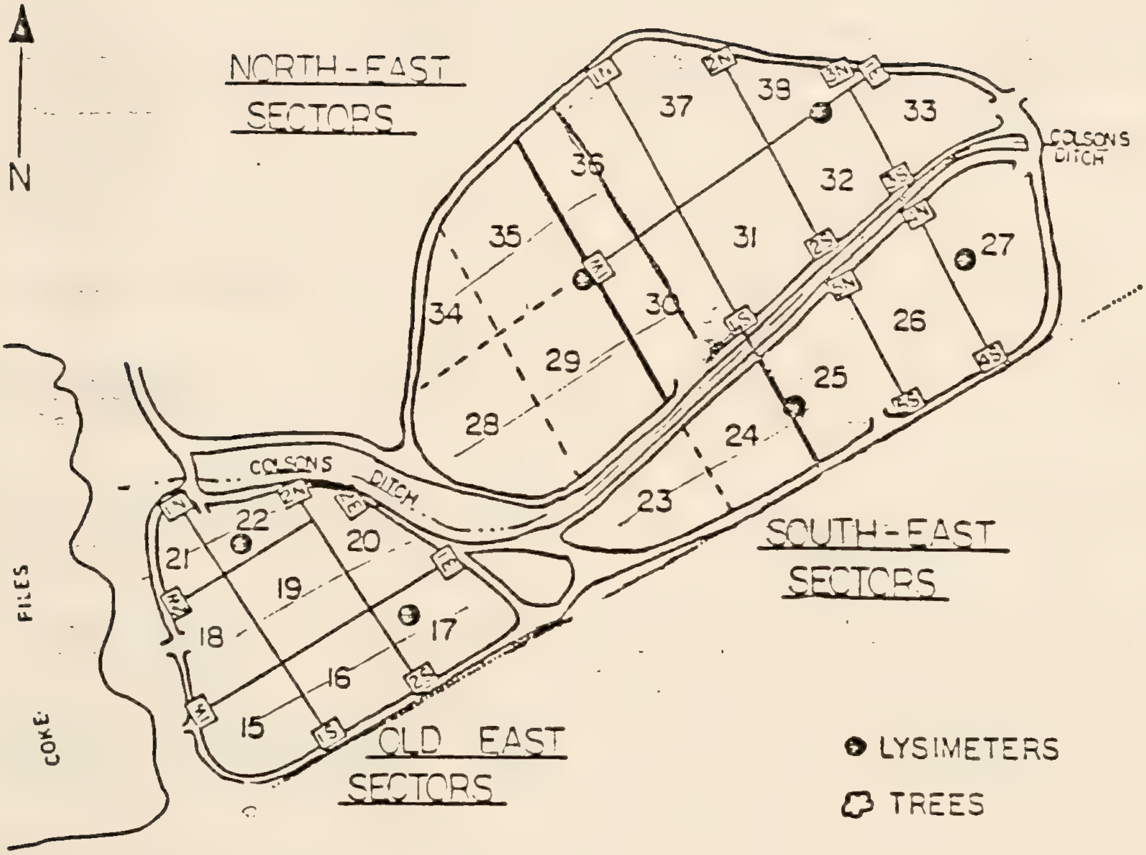
   - Anthracene
   - Benzo(a)anthracene
   - Benzo(b)fluoranthene
   - Benzo(k)fluoranthene
   - Benzo(j)fluoranthene
   - Benzo(a)pyrene
   - Bis(2-ethylhexyl) phthalate
   - Butyl benzyl phthalate
   - Chrysene
   - Dibenz(a,h)acridine
   - Dibenz(a,h)anthracene
   - Dichlorobenzenes (o-, m-, and p-dichlorobenzene)
   - Dimethyl phthalate
   - 7,12-Dimethylbenz(a)anthracene
   - Dimethyl phthalate
   - Di(n)butyl phthalate
   - Di(n)octyl phthalate
   - Fluoranthene
   - Indene
   - Methyl chrysene
   - 1-Methyl naphthalene
   - Naphthalene
   - Phenanthrene
   - Pyrene
   - Pyridine
   - Quinoline

4. Semi-volatile Acid-Extractable Compounds

   - Benzenethiol
   - Cresols (o-, m-, and p-cresol)
   - 2,4-Dimethylphenol
   - 2,4-Dinitrophenol
   - 4-Nitrophenol
   - Phenol

Reference: Internal Memo, Rocky Mountain Analytical Laboratory, Refinery Task Group, 5/3/85.

From: Table 14.2, Exxon Billings Refinery Part B Permit Application


N
NORTH-EAST SECTORS
SOUTH-EAST SECTORS
OLD EAST SECTORS
COLSONS DITCH
COLSONS DITCH
FILES
COKE
15
16
17
18
19
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38
● LYSIMETERS
TREES

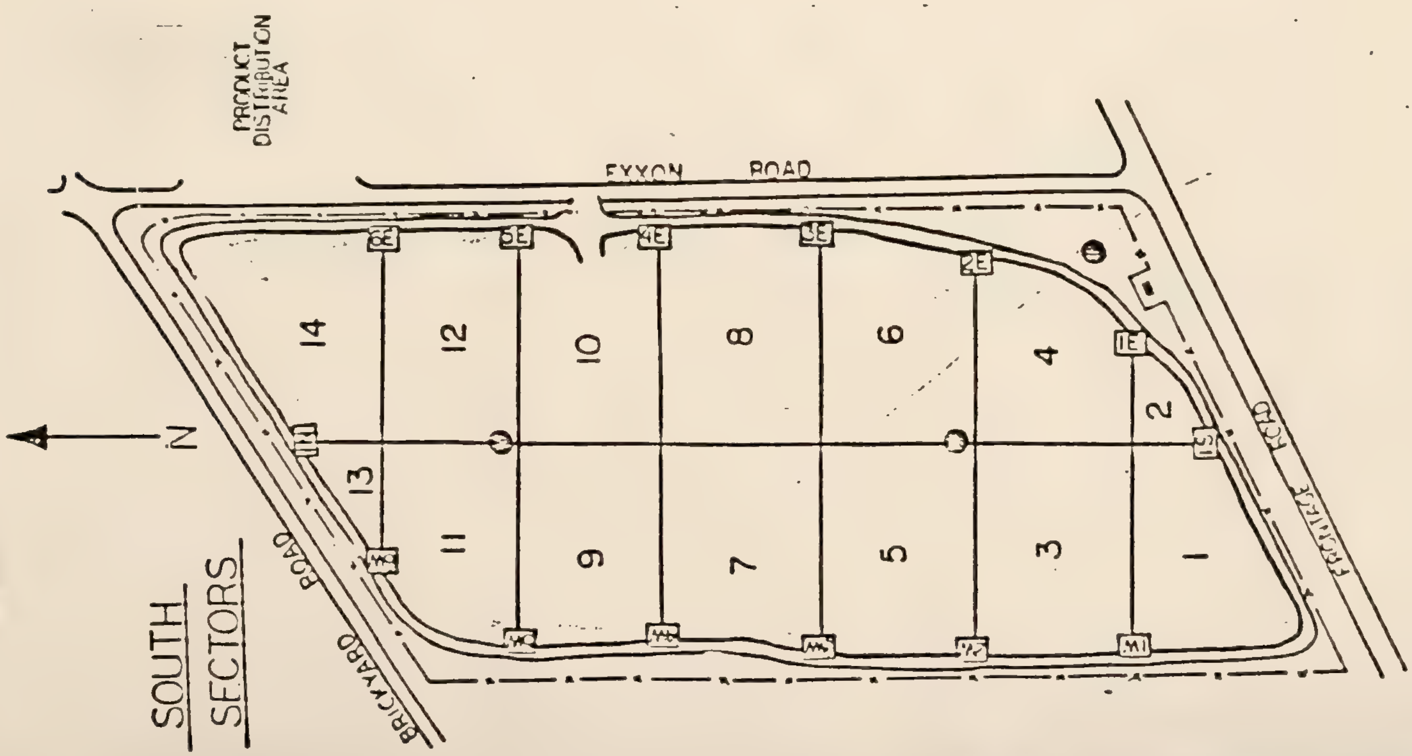

PRODUCT DISTRIBUTION AREA
EXXON ROAD
BRICKYARD ROAD
FRONTAGE ROAD
SOUTH SECTORS
N
1
2
3
4
5
6
7
8
9
10
11
12
13
14
1E
2E
3E
4E
5E
6E

TABLE 14.8 DETERMINATION OF COMPOSITE WASTE

Name of Waste	Annualized Quantity (metric tone/yr)	Approximate Wt% Freon Extractables	Approximate Mass of Freon Extractable (metric tons/yr)
API Separator Sludge	1300	30	390
Asphaltic Residues	5	50	3
Contaminated Soil & Gravel	1300	2	26
Cooling Tower Sludge	5	0	0.0
Crude Tankage	10	80	80
Intermediate Tankage Bottoms	10	40	4
Oxidation Pond	1400	0-20	0-28
Slop Oil Emulsion Solids	910	20	182
Unleaded Product Tankage Bottoms	15	40	6
Total	4955	--	691-719
Average	--	14.0	--

14.2.3 Measures to Control Soil pH

The current average soil pH in the treatment zone of the New and Old East Land Treatment units is 7.4 and 7.3 respectively. Values for the New Unit range from 6 to 8.1 while for the Old East Unit the range is 6.5 to 8.0.

The soil average pH in both units is maintained between 6.5 and 9.0 because Exxon experience has shown this to be the optimal range for microbial activity while minimizing the leaching of metals. Powdered lime or lime sludge from the boiler feedwater treatment unit is used for pH control.

Soil pH is monitored in the following manner. At least three composite soil samples are collected each spring from each uniform active area. Composite samples are collected by using a soil sampling tube (approximately 2 cm diameter). For each composite sample, a total of approximately ten individual core samples are taken at random locations over the entire sampling area. The top 23 cm of soil in each core is selected. The ten individual core samples are placed in a bucket and thoroughly mixed to form one composite sample. A portion of the sample is then mixed with an equal mass of distilled water, and the pH is measured using a pH meter.

To determine the amount of lime needed to increase the soil pH, 25, 50, 100, 200, and 300 mg of lime are added to 10 gm samples of soil. The samples are then placed in beakers, mixed, covered, and allowed to equilibrate for one week at room temperature. The pH of each sample is then determined. The proportion of lime required to elevate the soil pH to 7.0 is then added to the respective land treatment areas. Lime application is accomplished by using the most cost effective means to ensure uniform coverage.

14.2.4 Measures to Enhance Microbial or Chemical Reactions

From April through October, the active portions of the land treatment units are tilled at least once per month with a tool bar or disk-harrow. Tilling is not done when the soil is excessively wet or dry. Tilling an extremely wet soil does not promote aerobic bacterial activity while tilling an overly dry soil may create dust problems and reduce the soil moisture content below acceptable levels.

Fertilizer is added on an as needed basis to the land treatment units, usually each spring, concurrently with lime addition. In order to determine the proper amount of fertilizer to add, soil samples taken to determine lime requirement are sent to a soil lab to determine available nitrogen, phosphorous, and potassium. These analyses are performed in accordance with procedures in "Methods of Soil Analysis" Publication Number 9 in the series Agronomy, published by the American Society of Agronomy, sponsored jointly by the American Society of Agronomy and the American Society for Testing and Materials.

If the available soil nitrogen is below 340 kg/hectare as N, then nitrogen is added in the form of agricultural fertilizer to raise it above this level. If the N content is above 340 kg/hectare than a minimum of 60 kg/hectare may be added in the spring to provide readily available nitrogen until the soil has warmed and mineralization has reached a sufficient level to release adequate nitrogen from soil humus.

If the available phosphorous is below 45 kg/hectare as P, then phosphorous is added in the form of agricultural fertilizer to raise it above this level.

If the available potassium is below 225 kg/hectare as K, then potassium is added in the form of agricultural fertilizer to raise it above this level. Fertilizer addition will be accomplished using an agricultural applicator to ensure uniform application.

14.2.5 Measures to Control Soil Moisture in the Treatment Zone

A monthly hydrologic balance is presented in Table 14.12. According to the balance, the treatment units should generate little if any leachate on the month average due to the high evaporation rates. The high evaporation rates can dry out the soil excessively and retard microbial activity. This effect is in practice mitigated somewhat by applying wastes at a higher aerial loading rate during arid periods as long as the Freon extractables loading rate limit is not surpassed. With this approach, experience has shown that no supplementary irrigation is needed. At the same time, no subsurface drainage structures have been provided nor deemed necessary.

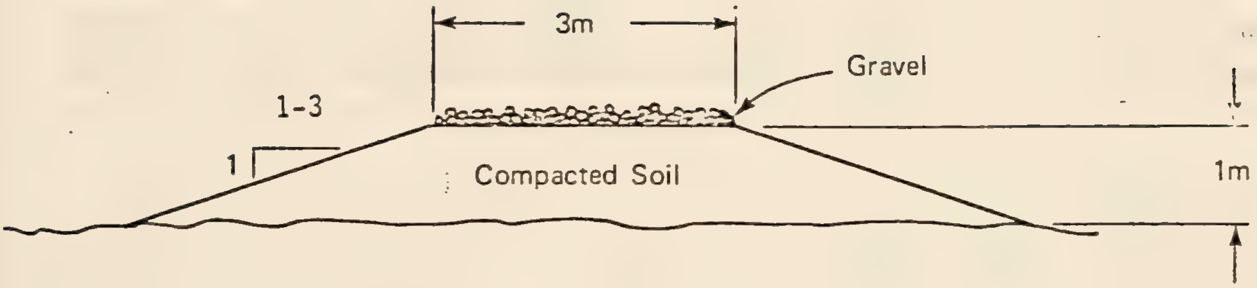


Figure 14.8

CROSS SECTION OF TYPICAL LAND TREATMENT UNIT DIKE

Table 5-1. INSPECTION SCHEDULE FOR THE HAZARDOUS WASTE FACILITIES AT THE EXXON BILLINGS REFINERY

Area/Equipment	Specific Item	Type of Problem	Frequency of Inspections
Safety and Emergency Equipment	Standard industrial absorbents	Low stock	Monthly/as needed
	Pumps	Power, clogging	Monthly
	Flexible hoses with quick couple fittings	Cracks or holes, fittings stick	Monthly
	55 gallon drums (steel, stainless steel)	Corrosion, structural damage	Monthly
	Face shields	Broken or dirty equipment	Monthly
	Fire and safety equipment	-----------	Per Exxon Safety Inspection Schedule
	Protective clothing	Holes, normal wear and tear	As used
Security Devices	Refinery perimeter, fences and gates	Corrosion, damage to chain-link fence or barbed wire	Daily
	Refinery perimeter, warning signs	Missing, damaged	Daily
Waste Staging Area	Concrete pads and curb walls	Cracks, liquids standing, signs of leaks	Weekly
	Sumps	Cracks, liquids standing	Weekly and after storms

Table [illegible]. (Concluded)

Area/Equipment	Specific Item	Type of Problem	Frequency of Inspections
	Pumps	Power, clogging	Monthly, if in use
	Containers	Leaks, container in poor condition. Container not closed. Corrosion, placement	Weekly
	Fence and warning signs	Fence secure. Signs in place and visible.	Weekly
Lead Weathering Tank	Tank	Corrosion, discoloration, cracks, etc.	Weekly
	Tank pad	Cracks, spills	Weekly
	Dike	Leakage, erosion, deterioration	Weekly
	Fence	Secure, gate locked	Daily
	Warning signs	Present, visible	Daily
	Freeboard	Insufficient freeboard	Daily
Land Treatment Areas	Warning signs, fences	Security	Daily
	Dikes	Leakage, erosion	Weekly

Exhibit 5-7.

Date and Time: ________ ________ ________ ________

East Land Farm
Inspect Once Per Week

	Yes or No			
1. Dikes show no signs of leakage, erosion, or deterioration.				
2. Perimeter fence is secure and in good condition.				
3. Warning signs are present and visible.				
4. Groundwater monitoring wells, quadrange markers, and lysimeters have not been altered by land tilling equipment.				

South Land Farm
Inspect Once Per Week

1. Dikes show no signs of leakage, erosion, or deterioration.				
2. Perimeter fence is secure and in good condition.				
3. Warning signs are present and visible.				
4. Groundwater monitoring wells, quadrant markers, and lysimeters have not been altered by land tilling equipment.				
5. Gate is locked when not in use.				

NOTE: Return to Process Stenographer

ATTACHMENT IIIa14

TO WHOM IT MAY CONCERN:

Be it known to any perspective purchaser of the property in question, that beginning in the year 1981 A.D. and ending in the year 2013 A.D. that said property was used for the treatment and disposal of hazardous wastes as defined under Title 40 of the Code of Federal Regulations, Part 261 using standards found under Title 40 of the Code of Federal Regulations, Part 264 (1983). This notification is affixed to this deed consistent with Section 264.120 of the same regulations.

The volume of wastes disposed of at these facilities are estimated, through records maintained during the operating life of the facility, at ____. The area of treatment and disposal are shown on the attached.

The potential purchaser of said property is hereby notified that use of this property is restricted to the conditions found at Title 40 of the Code of Federal Regulations, Part 264 subsections 264.117(c) and 264.120, dated 1983.

Signed M D Hebert
M. D. Hebert
Refinery Manager

STATE OF MONTANA)
: ss.
County of Yellowstone)

On this 28th day of September, 1983, before me, the undersigned, a Notary Public for the State of Montana, personally appeared M. D. Hebert, known to me to be the person(s) whose name(s) are subscribed to the within instrument and acknowledged to me that he/she executed the same.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed by official seal the day and year in this certificate first above written.

(SEAL)

Elaine J. Stoltz
NOTARY PUBLIC FOR THE STATE OF MONTANA
Residing at Billings, Montana
My Commission Expires: 10-19-83

Land Treatment Operational Monitoring Schedule

Material	Parameters	Frequency
K049 and K051	- modified Skinner list (Attachment IIIa6)	bi-annually
	- FE, pH, % moisture, metals scan (include all metals in Attachment IIIa1)	as generated
non-hazardous wastes	see Attachment IIIa16	as generated
soil-pore liquid	PHCs (Attachment IIIa5)	2 times per year
ZOI soils	FE	minimum of 6 times per year
	pH, nutrients, metals	annually
BTZ soils	PHCs (Attachment IIIa5)	annually

Table 4-2. TYPE OF ANALYSIS AND RATIONALE FOR SELECTING THE ANALYSIS TO DETERMINE WASTE SUITABILITY FOR LAND TREATMENT

Type of Analysis	Rationale for Selection
Organic Analysis	
• Oil and grease (Freon extractables)	• Indication of the fraction of the waste that will biodegrade
Inorganic Analysis	
• Percent moisture	• Fraction which will disappear through evaporation
• Metals Scan	• Potentially toxic metals per the Tier III (LTD Guidance Manual) requirements
• EP toxicity test	• Required before a waste is land treated
• pH	• Indication of impact on microorganisms

ATTACHMENT IIIa17

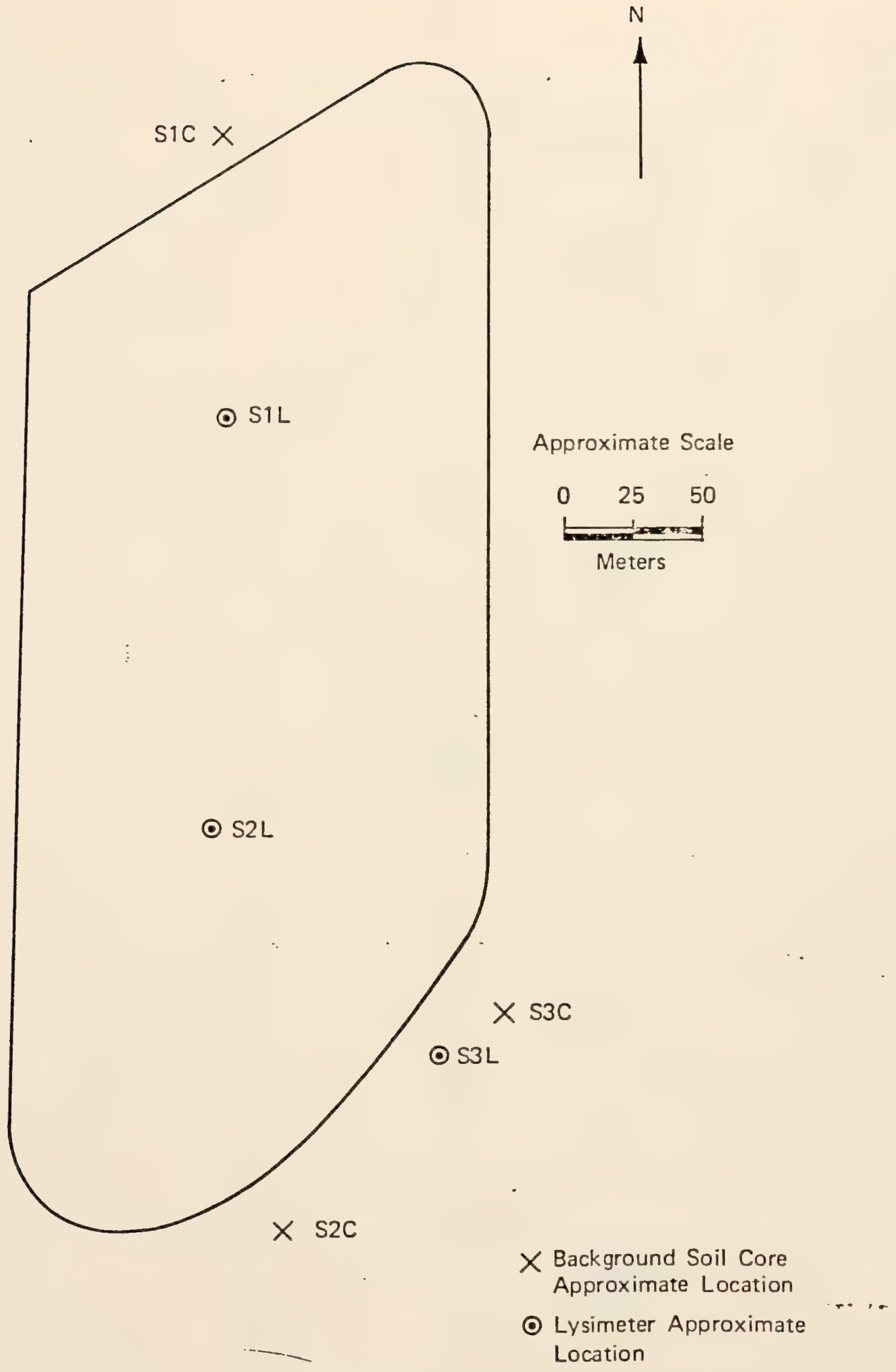

N
S1C
S1L
S2L
S3C
S3L
S2C
Approximate Scale
0
25
50
Meters
Background Soil Core Approximate Location
Lysimeter Approximate Location

Figure 14.2

NEW SOUTH LAND TREATMENT UNIT LYSIMETER AND BACKGROUND SOIL CORE LOCATION

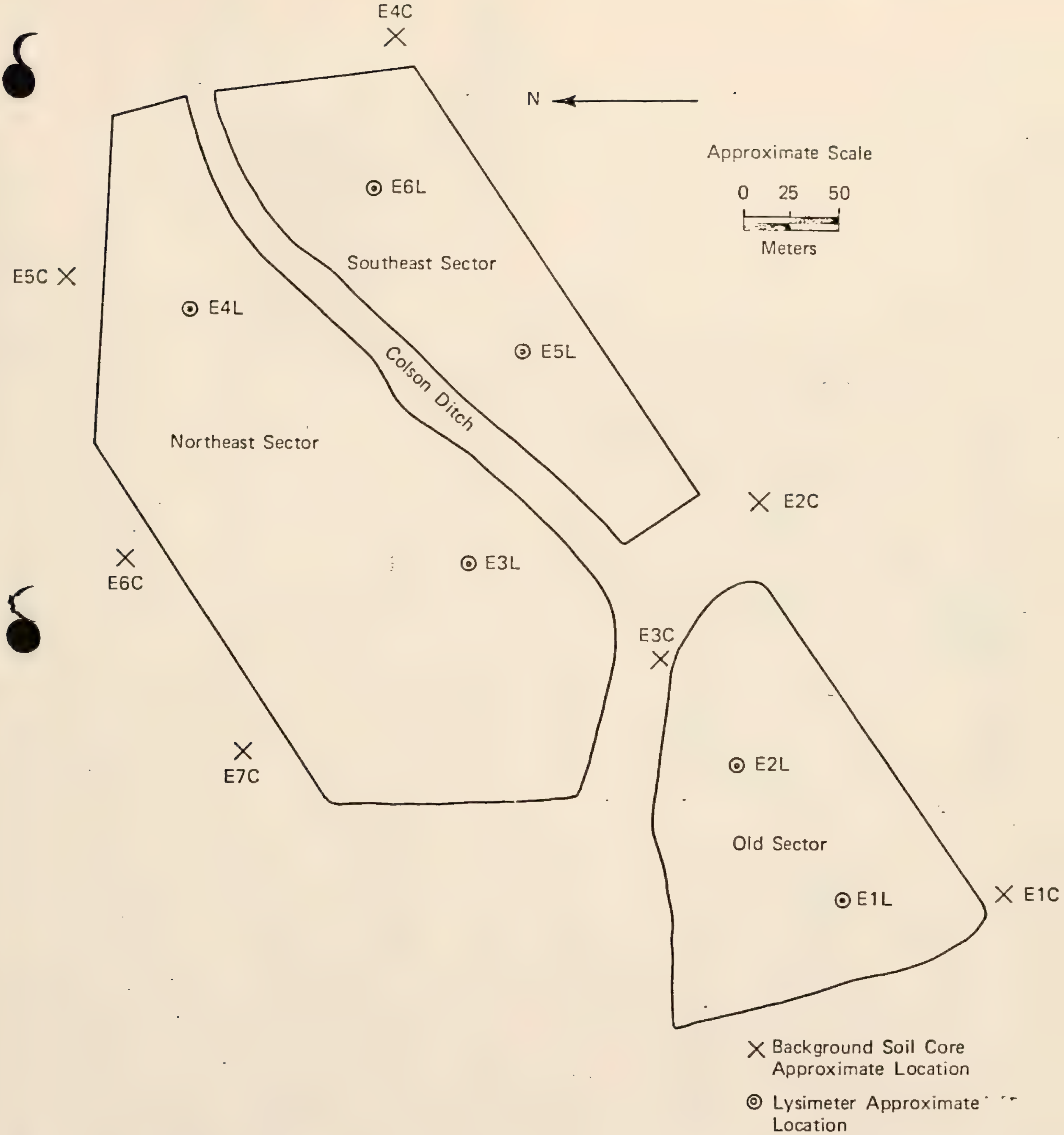
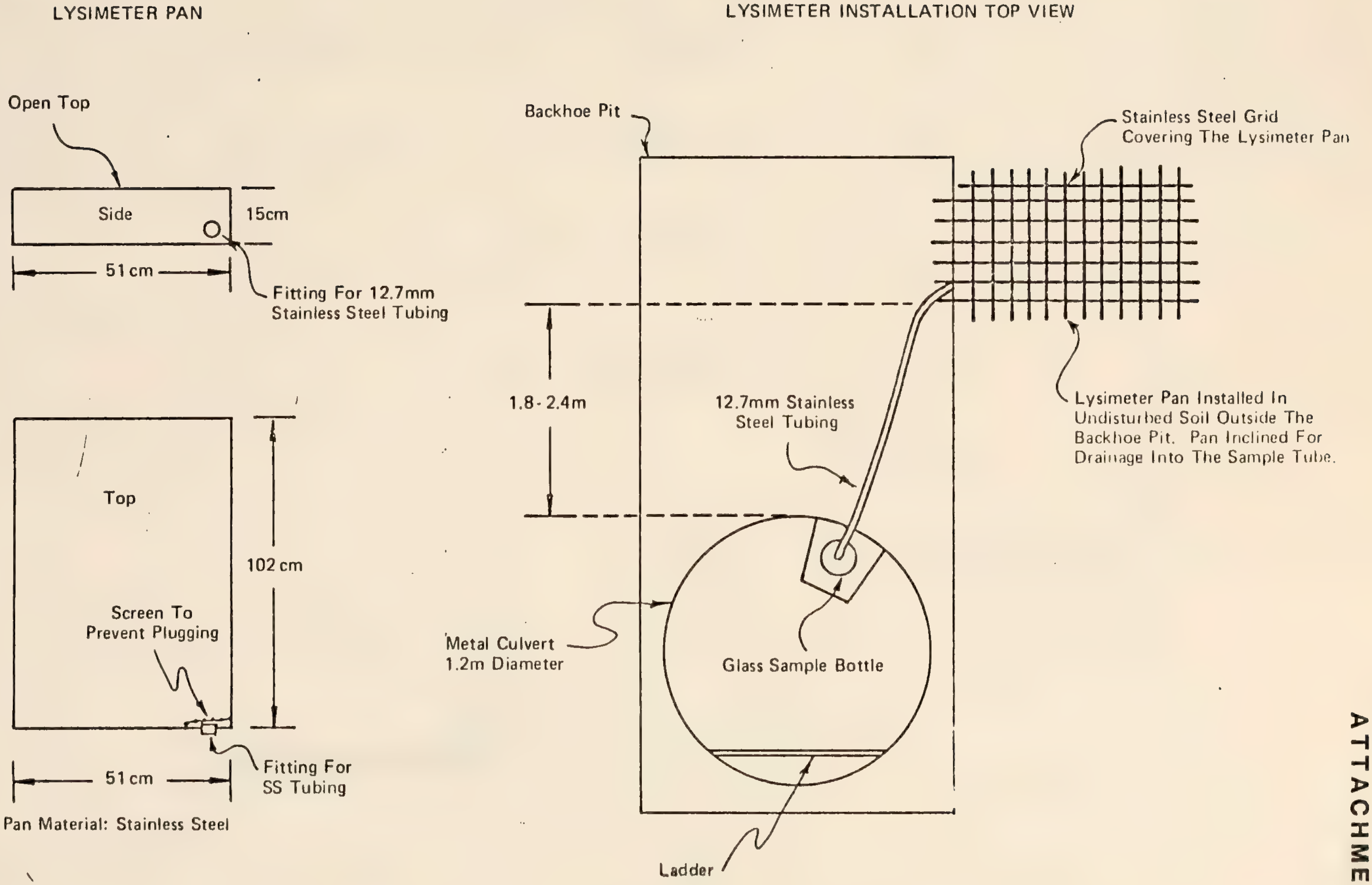


Figure 14.3

NEW AND OLD EAST LAND TREATMENT UNIT LYSIMETER AND BACKGROUND SOIL CORE LOCATION



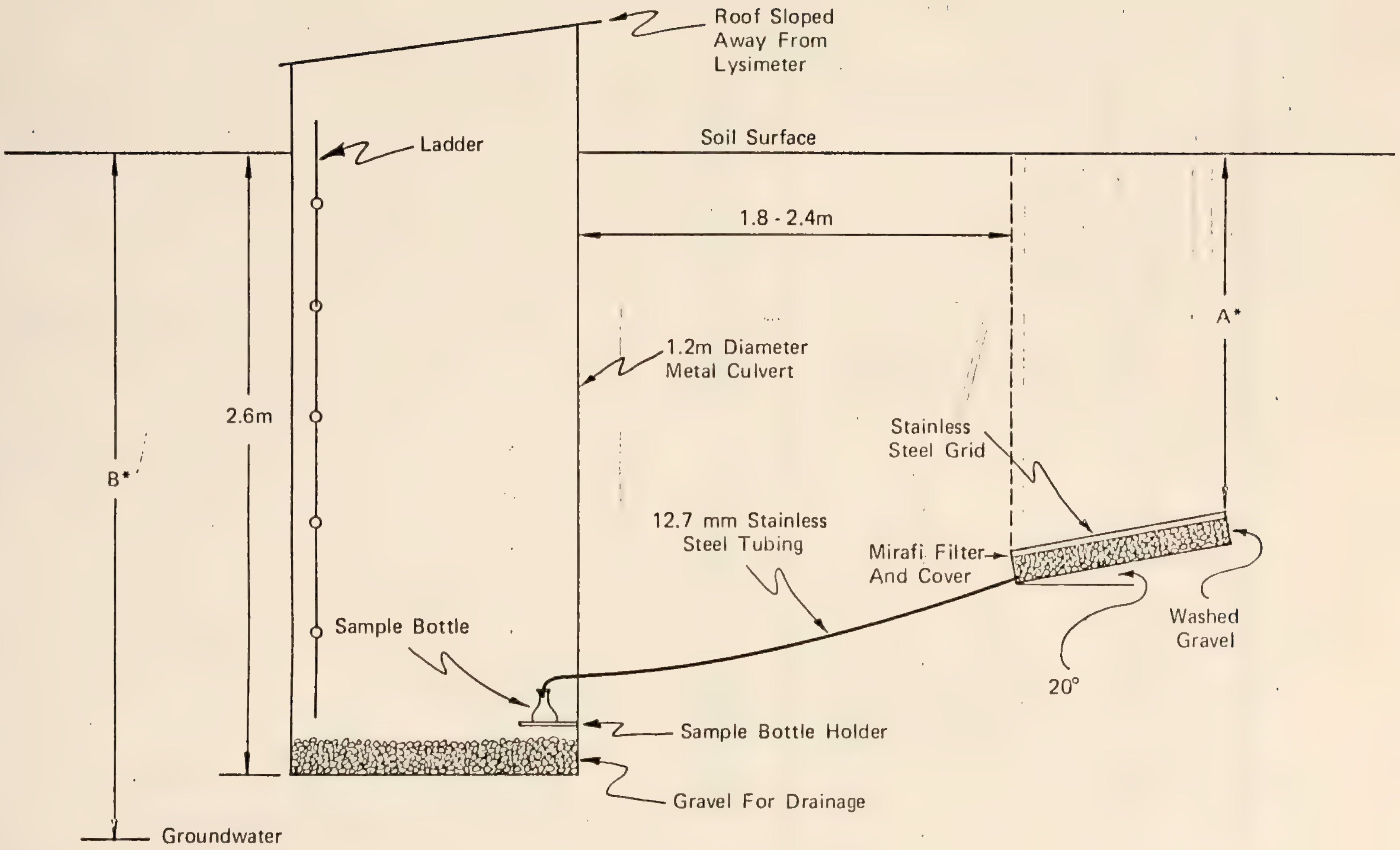
LYSIMETER PAN

LYSIMETER INSTALLATION TOP VIEW

Open Top
Side
15cm
51 cm
Fitting For 12.7mm Stainless Steel Tubing
Top
102 cm
Screen To Prevent Plugging
Fitting For SS Tubing
51 cm
Pan Material: Stainless Steel
Backhoe Pit
Stainless Steel Grid Covering The Lysimeter Pan
1.8 - 2.4m
12.7mm Stainless Steel Tubing
Lysimeter Pan Installed In Undisturbed Soil Outside The Backhoe Pit. Pan Inclined For Drainage Into The Sample Tube.
Metal Culvert 1.2m Diameter
Glass Sample Bottle
Ladder

Figure 14.4

LYSIMETER CONSTRUCTION DETAILS



* See Table 14.17

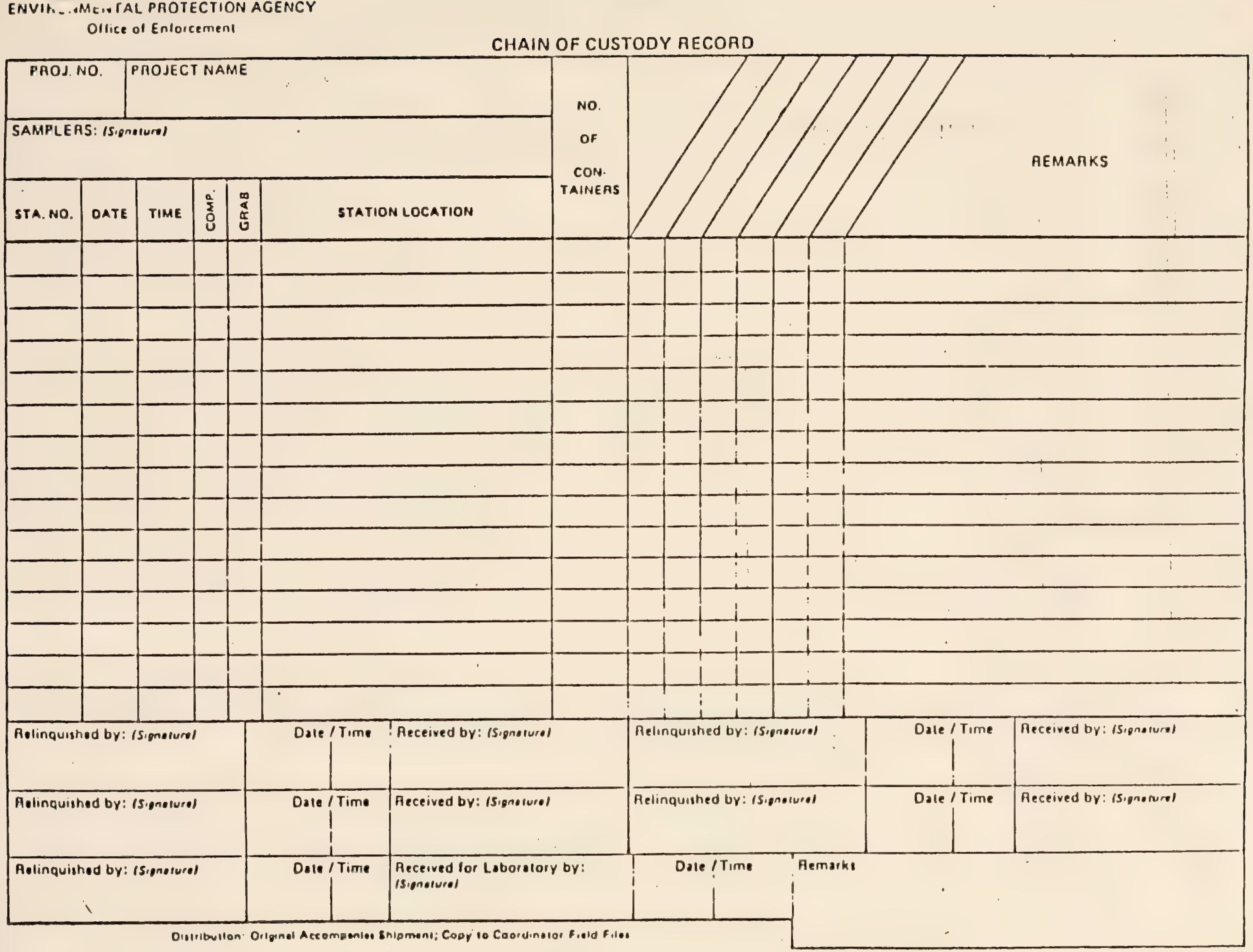
Figure 14.5

SIDEVIEW OF LYSIMETER INSTALLATION

TABLE 14.13. SPATIAL RELATIONSHIP OF LYSIMETER PANS TO SOIL SURFACE

Lysimeter*	A Distance from Soil Surface to Top of Pan (cm)	B Minimum Distance from Soil Surface to Groundwater (cm)
E1	122	335
E2	122	335
E3	91	128
E4	91	191
E5	122	183
E6	122	237
S1	122	427
S2	122	450
S3	122	472

* See Figure 14.2 & 14.3 for Lysimeter Locations, installed prior to November, 1981.



ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
SAMPLERS: *(Signature)*	

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CON-TAINERS							REMARKS

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

Figure 3. Example of chain-of-custody record.

Appendix 14.III. Random Sampling Procedure

For random sampling purposes, the South Land Treatment area has been assigned random sampling coordinates "A" and "B". The East Treatment area has been divided into an old sector, coordinates "C" and "D", and the combined northeast and southeast sectors, coordinates "E" and "F".

In order to select random sampling points, two random numbers are drawn from a random number table. These numbers locate the intersection of two lines drawn perpendicular to the base sampling coordinates. This intersection represents one randomly selected location for the collection of one soil core. If this location at the intersection is outside the uniform areas, it is disregarded, and the procedure is repeated.

Table 4-3. TEST METHODS

Parameter	Test Method	Reference
pH	Electrometric Method 9040	Test Methods for Evaluating Solid Waste. Physical/ Chemical Methods. U.S. EPA SW-846
Flash Point	Pensky-Martens closed-cup tester	ASTM Standard D-93-79 or D-93-80
EP Toxicity	EP toxicity test procedure	40 CFR 261 Appendix II
Free Liquids	Method 9095	U.S. EPA SW-846
Oil and Grease (Freon extractables)	Gravimetric after Soxhlet Extraction with Freon, Method 3540	Methods for Chemical Analysis of Water and Waste or U.S. EPA SW-846
Organic Lead	No specific test method available	
Percent Solids	Method 3540 with gravimetric analysis of solid residue	U.S. EPA SW-846
Percent Water	Carl Fischer titration or Dean Stark Method 209A	ASTM Standard Methods
Metals	Method 6010 except: Antimony-Method 7041 Arsenic-Method 7061 Lead-Method 7421 Mercury-Method 7471 Selenium-Method 7740	U.S. EPA SW-846
Volatile Organic	Method 8240	U.S. EPA SW-846
Semi-volatile (Base/ Neutral Extractables)	Method 8270	U.S. EPA SW-846
Semi-volatile (Acid Extractables)	Method 8270	U.S. EPA SW-846

TABLE 14.3 ANALYTICAL PROCEDURES FOR PROPOSED MODIFIED TIER I AND TIER III ANALYSES

Constituent	Analytical Procedures
Tier I	
- Percent Solids*	SW 846, Method 3540 with gravimetric analysis of solid residue.
- Percent Water*	Carl Fischer titration or Dean Stark Method
- Freon Extractables	SW 846, Method 3540 with gravimetric analysis of solvent/ oil fraction.
Tier III	
- Metals	SW 846, Method 6010 except: Antimony - Method 7041 Arsenic - Method 7061 Lead** - Method 7421 Mercury - Method 7471 Selenium - Method 7740
- Volatile Organic	SW 846, Method 8240
- Semi-volatile (Base/Neutral Extractables)	SW 846, Method 8270
- Semi-volatile (Acid Extractables)	SW 846, Method 8270

*For waste analysis only

**For groundwater samples; soil cores and wastes will be analyzed using Method 6010.

No post closure care of the Lead Weathering Tank is required because all hazardous waste will be removed from the facility. The tank itself will be non-hazardous due to the washing procedures.

11.1.7 Closure of Land Treatment Areas

The following procedures will be used to close the Land Treatment Areas:

A. Closure will begin upon receipt of the last load of waste.

B. Normal operating procedures will be followed for a minimum of one year after the receipt of the last load of waste to allow degradation.

C. During the stabilization period soil core, lysimeter (soil pore), and ground water samples will be collected to verify when biodegradation is complete and ensure no contamination has taken place.

D. Lime will be spread on the land, if necessary, to maintain the pH between 7 and 8.

NOTE: As oily wastes degrade, there is the remote possibility of wind dispersal. Trees and geographic location of the treatment areas prevent a significant impact. Also due to the short time period between final waste application and addition of top soil (E) exposure to excessive dispersal is negligible. In addition, the Erosion Wind GP values presented in Table 14.22 indicate susceptibility to erosion is quite low. Therefore, no additional wind dispersal control is necessary.

E. The Land Treatment Areas will be covered with 6 inches of topsoil.

F. Topsoil will be graded to approximately 1 percent for drainage.

G. The topsoil will be fertilized and revegetated with Western Wheatgrass (agropyron smithii), or an equivalent crested wheatgrass sodforming variety to prevent erosion and inhibit infiltration of rain water.

Revegetation by seeding is to be completed in the fall to allow optimum stand establishment.

H. Equipment will be decontaminated/washed before use outside the facility.

Equipment required for closure of the Land Treatment Areas would include:

- Tilling equipment
- Truck to haul lime and topsoil
- Grader
- Miscellaneous tools

All operations will continue to minimize run-off of hazardous constituents, to control run-on and wind disposal. Groundwater and unsaturated zone monitoring will continue per Table 11-1.

11.1.8 Location, Copies, and Update of Closure Plan

Copies of the closure plan will be located in the following areas:

1. Process Department Head - one copy
2. Environmental Coordinator - one copy
3. Environmental Engineer -one copy
4. Process Engineering Division - two copies

The Environmental Engineer in the Environmental Section will be responsible for updating the facility/post closure plans. This individual is the key contact during the post-closure period. At the present time, the Environmental Engineer is Mr. David DeBats (phone (406) 657-5343) who is located at the Exxon Refinery, Billings, Montana. In accordance with 264.112(b) and 124.5(a), the owner or operator may amend the closure plan whenever changes in operating plans or facility design affects the closure plan, or whenever there is a change in the expected year of closure.

When substantial changes in the facilities' operations require the updating of the closure plan, the Environmnetal Engineer will update the plan and send copies of the updated plan to all persons who have copies of the plan. This is the same procedure that is used to update the SPCC plan.

11.2 POST CLOSURE OF LAND TREATMENT AREA

During the closure of the land treatment areas, normal operating procedures will be used to enhance degradation and transportation and sustain immobilization of any hazardous constituents in the treatment zone. Security measures and inspecting are anticipated as described in Subsection 5.0 throughout the post closure permit. Because there is expected to be some statistical increase in some constituents in the treatment zone after closure no exemption from the post closure requirements of 40 CFR Part 164 is likely to be requested. Therefore, the following sections are provided should no exemption be available pursuant to 40 CFR 264.280(d) and (e). It should be noted that any change in the number of monitoring wells or core samples taken will need to be reflected in the post-closure plans. It is intended that the following items continue throughout the post-closure periosd.

11.2.1 Vegetative Cover

As specified in subsection 11.1.6 and subsection 14.5, a vegetative cover of Western Wheatgrass, a non-food chain material, is placed on top of a 15 cm (6 inch) layer of topsoil added to the landfarm during closure. This native plant, or an equivalent Wheatgrass variety, is chosen due to its drought, cold, and sodfarming adaptations. This plant is long lived and spreads rapidly.

By the time the top soil is added, degradation, transformation and immobilization have been completed. Therefore, the addition of the top soil and vegetative cover will not impede hazardous constituent degradation, transformation or immobilization. Crested Wheatgrass was specifically chosen because it requires little or no maintenance under normal conditions.

11.2.2 Run-off and Run-on Control

The existing dikes which surround the land treatment areas will continue to function as run-off and run-on control facilities until the post-closure period ends. Then it is anticipated these dikes will be leveled.

11.2.3 Wind Dispersal/Moisture Control

The layer of top soil added to the land treatment areas at the time of closure will prevent any dispersal of hazardous constituents due to wind. The topsoil will be vegetated with native Western Wheatgrass which will act to control moisture and wind erosion.

11.2.4 Unsaturated Zone Monitoring

Soil Pore

During closure the final lysimeter samples will be taken not only 90 days after the last waste is applied but also at the time the new topsoil is revegetated. The lystimeters will remain in place and periodic sampling may be conducted though it is not planned, during post-closure. See Table 11-1 for analysis to be performed.

Soil Core

A set of core samples will be taken while revegetation is taking place to allow a soils scientist adequate justification to certify the land treatment areas are closed.

Additional corings will be obtained and analyzed by following a geometrically progressive schedule of six months, year one, year two, year four, year eight, year sixteen and year thrity after the post-closure care period begins. See Table 11-1 for analysis to be performed.

11.2.5 Ground Water Monitoring

Groundwater monitoring around the land treatment areas will be performed on a semi-annuyal basis using the protocol of the Detection Monitoring Program

identified in Subsection 15.4 of this application. The monitoring parameter will only be total organic carbon. Inorganic parameters were excluded because the primary hazardous constituent metals should all be retained and insoluble in the treatment zone. If active life monitoring indicates otherwise, then these parameters (i.e. nickel, lead, chromium) may be included for monitoring groundwater. Such a post-closure monitoring program is justified following a long term detection monitoring mode because:

1. After the active life and closure period of performing detection monitoring, a suffiecient data base will have been developed for this parameter to be able to identify when somethis has occurred to cause a statistical difference during post closure. If a statistical difference occurs, based on the knowledge of the wastes treated and chemical components contained therein, additional immediate groundwater analysis will be performed to identify the hazardous constituents likely to be contaminating the groundwater.

2. If no contamination occurred during the long active life and closure perios (estimated at 30 years), the probability is low that any measurable contamination would occur following facility closure.

11.2.6 Maintenance Activities

Soil pH and nutrient levels will be checked every five years during the post closure time period. Vegetative cover and soil cap integrity will be inspected annually. Routine mainteneance on the well, dikes, vegetative cover, and associated security facilities will be performed as needed. Some specifics might include replacement of a well pump once in ten years, revegetating parts of the land treatment covering and cap, possibly on a bi-annual basis, or adding some gravel on the top of the dikes once in fifteen years. The post-closure cost estimate includes this type of maintenance program.

11.2.7 Amendments

Whenever changes in operating plans or facility design occur during the active life or post-closure period that affect this post-closure plan, the

plan will be amended. Whenever a permit modification for such changes is requested, appropriate post-closure plan amendment will be included with the requested modification.

11.3 NOTICE IN DEED AND NOTICE TO LOCAL LAND AUTHORITIES

Attachment 11.I contains the notice provided to the County Clerk and Recorders Office to be attached to Exxon's warranty deed. This meeets the requirements addressed as Part 264.120, except that item 264.120(a)(3) dealing with quantity of hazardous wastes has not been filled-in since the land treatment units have not been closed and no means of developing a realistic estimate exists. The notice leaves a blank for the quantity which will be filled in if the property is ever sold. The quantity will be based on the review of the operating records and bi-annual reports. Type of wastes include the following materials:

- API Separator and Slop Oil Emulsion Tank Sludges
- Crude, Intermediate, and Product Tank Sludges
- Process Unit Sludges and Oil Contaminated Dirts

These wastes are likely to contain trace amounts of heavy metals and/or aromatic hydrocarbons.

This notice along with a survey plat (derived from the topographic map in Section 12.0) will be submitted to the County Clerk and Recorder's Office within 90 days of closure.

11.4 CLOSURE SCHEDULE

Closure activities will begin as soon as practical after the last hazardous wastes are received at each facility. The Waste Staging Area would be closed within 90 days after receipt of the last waste. The closure of the Lead Weathering Tank will require approximately 270 days after receipt of the last waste since all waste and wash water must be evaporated prior to final closure. The closure of the Land Treatment Areas will require approximately 18 months after receipt of the last waste since the area will continue normal operation for at least 12 months for degradation, and at least up to six

MODULE IIIb

LEAD WEATHERING TANK

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MODULE IIIb - LEAD WEATHERING TANK

A. APPLICABILITY

The requirements of this Permit Module apply to the operation of the lead weathering tank. The unit has been specifically designed and constructed to treat leaded tank bottoms, rendering them less hazardous. Exposure of tetraethyl lead to atmospheric oxygen oxides the organic lead and reduces the toxicity. Treated residues are removed from the tank to an off-site hazardous waste disposal facility. The Permittee must operate and maintain the waste staging area in accordance with the Permit, applicable requirements in Title 16, Chapter 44, ARM, and as specified in the Application.

B. PERMITTED WASTE

The only waste that shall be treated and stored in the lead weathering tank is:

EPA Hazardous Waste Number	Hazardous Waste
K052	- tank bottoms (leaded) from the petroleum refining industry

C. OFF-SITE WASTE

The Permittee shall not receive, store, or treat hazardous wastes in the lead weathering tank that are generated off-site .

D. WASTE ANALYSIS

EP toxicity, organic and inorganic lead analysis will be performed on representative samples of weathered sludges, prior to transport

to an off-site hazardous waste disposal facility, as described in Attachment IIIb1, under Leaded Tank Bottoms. Test methods shall conform to Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, EPA 1986 (SW-846).

All waste analysis results and all waste material profile sheets required by the Permittee's hazardous waste contractor shall be incorporated into the operating record.

E. SPECIAL REQUIREMENTS FOR IGNITABLE, REACTIVE OR INCOMPATIBLE WASTES

Ignitable, reactive, or incompatible wastes shall not be placed in the lead weathering tank. Use of the tank is limited strictly to leaded tank bottoms.

F. PERMITTED UNIT

The lead weathering tank is located within the Exxon Billings Refinery, Yellowstone County, Montana, T.1N, R.26E, Section 25. Attachment IIIb2 indicates its general location within the refinery.

The lead weathering tank has been constructed as described in Attachment IIIb3. Attachment IIIb4i is an engineering drawing of the tank system. The tank was constructed in June 1983. The 100'x100'x3' tank is placed on a double lined base, described on page 13-13 of Attachment IIIb3. There is an asphalt liner underlain with a PVC liner, with compacted sandy clay and leak detection pipes between the two liners. There are generally greater than two feet of freeboard in the tank.

The lead weathering tank was designed and constructed to meet the Permittee's engineering standards for storage tanks. The design standards are presented in Appendix 13.II of the Application.

The Permittee has provided an updated certification that the existing tank system has been assessed, and is adequately designed and is in good condition. The certification is provided in Attachment IIIb4ii.

Any changes to the lead weathering tank that would affect hazardous waste management practices shall only be made following permit modification as described in ARM 16.44.116 or ARM 16.44.118.

G. CONTAINMENT AND DETECTION OF RELEASES

The lead weathering tank is an existing tank system of known and documented age, constructed in June 1983, with an existing containment system. In accordance with 40 CFR 264.193(a)(3), incorporated by reference in ARM 16.44.702, the secondary containment system must be upgraded by June 1998 to meet the requirements listed below. The requirements are specific to tanks with a liner serving as the secondary containment system. If the Permittee chooses to retrofit with a vault, a double-walled tank, or equivalent secondary containment system, different requirements may apply.

Secondary containment systems must be:

1. Designed, installed, and operated to prevent any migration of wastes or accumulated liquid out of the system to the soil, groundwater, or surface water at any time during the use of the tank system.

2. Capable of detecting and collecting releases and accumulated liquids until the collected material is removed.

3. Constructed of or lined with materials that are compatible with the waste(s) to be placed in the tank system and must have sufficient strength and thickness to prevent failure owing to pressure gradients (including static head and external hydrological forces), physical contact with the waste to which it is exposed, climatic conditions, and the stress of daily operation (including stresses from nearby vehicular traffic).

4. Placed on a foundation or base capable of providing support to the secondary containment system, resistance to pressure gradients above and below the system, and capable of preventing failure due to settlement, compression, or uplift.

5. Provided with a leak-detection system that is designed and operated so that it will detect the failure of either the primary or secondary containment structure or the presence of any release of hazardous waste or accumulated liquid in the secondary containment system within 24 hours, or at the earliest practicable time if the Permittee can demonstrate to the Department that existing detection technologies or site conditions will not allow detection of a release within 24 hours.

6. Sloped or otherwise designed or operated to drain and remove liquids resulting from leaks, spills, or precipitation. Spilled or leaked waste and accumulated precipitation must be removed from the secondary containment system within 24 hours, or in as timely a manner as is possible to prevent harm to human health and the environment if the Permittee can demonstrate to the Department that removal of the released waste or accumulated precipitation cannot be accomplished within 24 hours.

7. External liner systems must be:

   a. Designed or operated to contain 100 percent of the capacity of the largest tank within its boundary;

   b. Designed or operated to prevent run-on or infiltration of precipitation into the secondary containment system unless the collection system has sufficient excess capacity to contain run-on or infiltration. Such additional capacity must be sufficient to contain precipitation from a 25-year, 24-hour rainfall event;

   c. Free of cracks or gaps; and

   d. Designed and installed to surround the tank completely and to cover all surrounding earth likely to come into contact with the waste if the waste is released from the tank(s) (i.e., capable of preventing lateral as well as vertical migration of the waste).

H. RESPONSE TO LEAKS OR SPILLS

A tank system or secondary containment system from which there has been a leak or spill, or which is unfit for use, must be removed from service immediately, and the Permittee must satisfy the following requirements:

1. Cessation of Use; Prevent Flow or Addition of Wastes

The Permittee must immediately stop the flow of hazardous waste into the tank system or secondary containment system and inspect the system to determine the cause of the release.

2. Removal of Waste from Tank System or Secondary Containment System

   a. If the release was from the tank system, the Permittee must, within 24 hours after detection of the leak or, if the Permittee demonstrates that it is not possible, at the earliest practicable time, remove as much of the waste as is necessary to prevent further release of hazardous waste to the environment and to allow inspection and repair of the tank system to be performed.

   b. If the material released was to a secondary containment system, all released materials must be removed within 24 hours or in as timely a manner as is possible to prevent harm to human health and the environment.

3. Containment of Visible Releases to the Environment

   The Permittee must immediately conduct a visual inspection of the release and, based upon that inspection:

   a. Prevent further migration of the leak or spill to soils or surface water; and

   b. Remove, and properly dispose of, any visible contamination of the soil or surface water.

4. Notification and Reports

   Any leak or spill from the tank to the environment, unless it represents a quantity of less than or equal to .5 kg (1 pound), or unless it is immediately contained and cleaned up, must be reported in accordance with Condition D.13. of Module I of this Permit.

I. OPERATION OF THE LEAD WEATHERING TANK

The lead weathering tank shall be operated and maintained in accordance with information presented in Attachment IIIb3, Section 13.10, and Attachment IIIb5, paragraph 5. At all times the Permittee shall:

- ensure that there is at least two feet of freeboard in the tank;

- ensure that waste is loaded, transported to the tank for treatment, and removed to drums following treatment in a safe manner, to prevent spillage, leakage, or unnecessary exposure of personnel;

- inspect and maintain the tank to prevent releases due to corrosion or other damage.

J. INSPECTION OF THE LEAD WEATHERING TANK

1. Attachment IIIb6 shows the general inspection schedule for the permitted hazardous waste units. Freeboard, fencing, and warning signs shall be inspected daily at the lead weathering tank, and results of the daily inspection shall be recorded on the inspection form shown in Attachment IIIb7. The tank, tank pad, and dike shall be inspected weekly for signs of corrosion, deterioration, leakages, cracks or spills. The inspection log form shown in Attachment IIIb8 shall be used for weekly inspections.

2. In addition to inspection items shown in Attachment IIIb8, the Permittee shall also check the eight exit points of the leak detection piping system weekly for leachate or blockage. The Permittee shall modify the inspection log form to reflect this within thirty days of Permit issuance.

3. The lead weathering tank shall be inspected by ultrasound or similar technique for shell thickness, at least every ten years. Tank bottom thickness using a pit-gauge caliper will be determined on the same frequency, to ensure minimum tank thickness of 0.125 inches. These inspections are described in paragraph 3 of Attachment IIIb9.

4. Results of all inspections shall be incorporated into the operating record.

K. RECORDKEEPING AND REPORTING

1. Recordkeeping

a. A written operating record of hazardous waste management activities at the lead weathering tank must be maintained. Records shall be kept of:

  - volumes of leaded tank bottoms placed in the tank for weathering
  - date of placement of wastes
  - date of removal of wastes to drums
  - results of waste analyses
  - waste material profile sheets, as required by the Permittee's hazardous waste contractor
  - hazardous waste manifests for offsite shipment
  - results of all inspections

b. Additionally, a valid permit, an updated closure plan and closure cost estimates and any permit modifications relating to the lead weathering tank must be kept on file.

c. All records required under this Condition must be furnished upon request, and made available at all

reasonable times for inspection by any duly designated representative of the Department.

2. Reporting

The Permittee shall report to the Department with 24 hours of occurrence any leaks, spills, or other non-compliances than may endanger health or the environment. Details of reporting procedures are contained in Condition D.13., Module I of this Permit.

L. CLOSURE

1. Performance Standard

The Permittee shall close the facility as required by 40 CFR 264.111, incorporated by reference in ARM 16.44.702, and in accordance with the closure plan outlined in Attachment IIIb10, with the exceptions/additions noted in Condition L.5., Disposal or Decontamination of Equipment. The intent of the lead weathering tank closure is to leave no wastes, residuals, or contamination resulting from the lead weathering tank in place. If this goal is achieved, long-term post-closure care and monitoring will not be required.

2. Amendment to Closure Plan

The Permittee shall amend the closure plan, whenever necessary in accordance with 40 CFR 264.112(b), incorporated by reference in ARM 16.44.702.

3. Notification of Closure

The Permittee shall notify the Department at least 180 days prior to the date closure is expected to begin.

4. Time Allowed for Closure

The Permittee is allowed up to 270 days for closure, after receiving the final volume of hazardous waste. At that time, the Permittee shall complete closure activities, in accordance with the schedule shown in Attachment IIIb11.

5. Disposal or Decontamination of Equipment

The Permittee shall decontaminate and/or dispose of all lead weathering tank equipment as required by 40 CFR 264.114, incorporated by reference in ARM 16.44.702, and described in Attachment IIIb10, with the following exceptions/additions:

a. Item F, page 11-8, Attachment IIIb11: All wash water and residues removed from the tank shall be considered hazardous waste, by mixture, and must be removed to a permitted hazardous waste facility. Evaporation to reduce volume before removal is acceptable.

b. Item I, page 11-8, Attachment IIIb11: Twenty-five samples of the sandy clay material shall be analyzed for total, rather than EP toxicity lead. The results for each analysis shall be compared to an average "background" lead concentration.

   The background average will be derived by averaging the total lead found in four samples, taken from the sandy clay overlying the PVC liner on each side of the pad, but not directly under the tank. The approximate location of each background sample is marked with an "X" on Attachment IIIb4i. If none of the 25 samples show lead concentrations statistically above background, then it can be assumed there was no leakage from the tank, and all

underlying components can be disposed as non-hazardous. If any of the soil samples are found to have lead concentrations above background, then within 30 days of receiving the analytical results, the Permittee must submit a plan to the Department for soil removal and additional sampling of components below the tank.

6. Certification of Closure

The Permittee shall certify that the lead weathering tank has been closed in accordance with the specifications in the closure plan, as required by 40 CFR 264.115, incorporated by reference in ARM 16.44.702.

Attachments

Module IIIb

Lead Weathering Tank

List of Attachments

Module IIIb - Lead Weathering Tank

IIIb1	Page 4-3, Waste Analysis of Leaded Tank Bottoms
IIIb2	Figure 13-1, Hazardous Waste Management Unit Locations
IIIb3	Sections 13.9-13.11, Design and Operation of the Lead Weathering Tank
IIIb4i	Appendix 13.I, Drawing of Lead Weathering Tank
IIIb4ii	Appendix 13.III, Lead Weathering Tank Certification
IIIb5	Section 8.1.2, Loading Lead Weathering Tank
IIIb6	Table 5-1, Inspection Schedule for Hazardous Waste Facilities
IIIb7	Exhibit 5-5A, Fence and Freeboard Inspection Log Form
IIIb8	Exhibit 5-8, Lead Weathering Tank Area Inspection Log Form
IIIb9	Page 5-6, Lead Weathering Tank Shell and Bottom Thickness Testing
IIIb10	Section 11.1.6, Closure/Post-Closure of Lead Weathering Tank
IIIb11	Figure 11-2, Schedule for Closure, Lead Weathering Tank

the sludge along with the application rate to the soil will be used to conservatively project the working lifetime of the land treatment area. Types of analysis and rationale for selecting the analysis are summarized in Table 4-2. Continued suitability for land treatment will be evaluated using the analyses of oil and grease, moisture, and metals content.

Slop Oil Emulsion Solids (Land Treatment)

Same as for API Separator Sludge above.

Leaded Tank Bottoms (Offsite Class 1)

EP toxicity, organic and inorganic lead analysis will be performed after sludges have weathered, prior to transporting the waste to an authorized hazardous waste land disposal facility. Since there is no test method for organic lead, it will be equal to the total lead minus the inorganic portion.

HF Acid Tar (Offsite Class1)

The HF acid tar will not be analyzed due to safety reasons discussed on Table 4-1.

Hazardous Material Spill Clean-up Wastes (Land treatment or offsite Class 1)

The analysis of these wastes will be determined on a case by case basis depending on the nature of the spill and material(s) involved. In general, selected analysis outlined in Table 4-2 will be performed, if uncertainty of the waste composition requires such analysis. If this analysis indicates land treatment is unsatisfactory, additional analysis will be performed if necessary to allow for disposal at an alternate hazardous waste disposal unit.

DEA Filter Cartridges (Offsite Class I)

Periodic analysis for EP toxicity only will be performed to assess if selenium is a leaching compound from this waste.

ATTACHMENT IIIb2

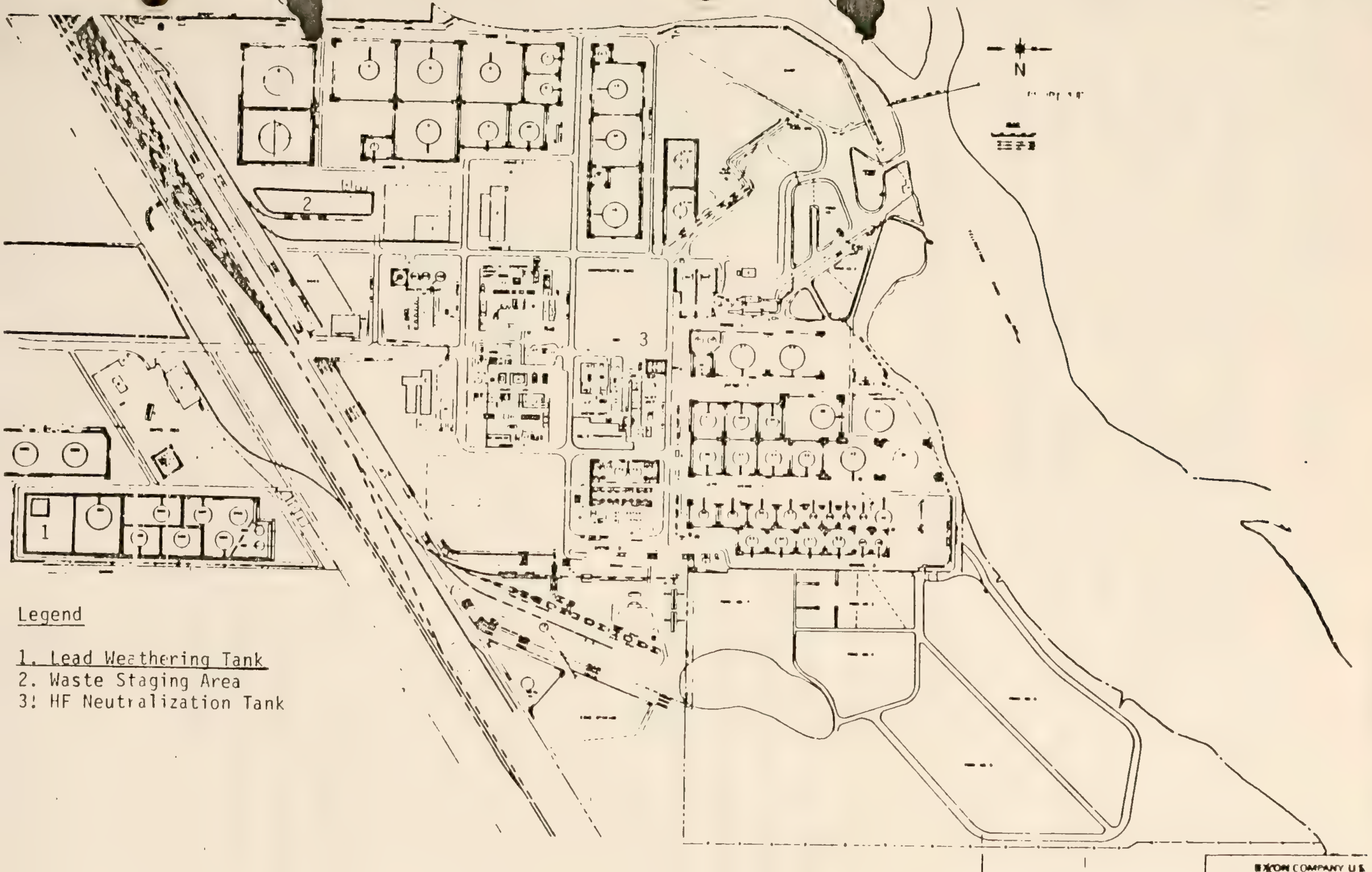


Figure 13-1. HAZARDOUS WASTE MANAGEMENT UNIT LOCATIONS FOR CONTAINER STORAGE AND TANKS

13.7 CONTAINERS WITH FREE LIQUIDS

Both the palletized drum storage pad and the drum crusher pad are designed as though all containers will contain 100% free liquids. No attempt will be made to determine if the containers holding wastes contain free liquids. All containers will be handled as if they contain free liquids. It is anticipated that most of the containers will not contain free liquids, based on Exxon's past experience and expected practice.

13.8 CONTAINERS HOLDING IGNITABLE OR INCOMPATIBLE WASTE

All containers containing wastes are sorted in the WSA. This unit is located within the refinery area and is more than 15 meters (50 feet). from the refinery property line (Figure 13-1). The refinery does not have any reactive or incompatible wastes. Ignitable wastes are rarely stored at the WSA; however, when they are stored, they are separated from other containers by an aisle of at least 10 feet (Figure 13-2). Wastes from sumps are placed in new or clean containers. All containers are clearly marked as to their contents.

13.9 BASIC DESIGN PARAMETERS FOR TREATMENT TANKS

13.9.1 Lead Weathering Tank

The lead weathering tank is specifically designed and constructed to treat wastes rendering them less hazardous. Exposure to atmospheric oxygen oxidizes the organic lead and greatly reduces the hazard associated with the waste. All leaded tank bottoms are placed in the tank and allowed to weather

for four to six months. After this weathering, the waste is ready for removal from the tank to drums and shipped to an approved hazardous waste disposal site. The 100' x 100' x 3' tank, with a total capacity of 30,000 ft^3 (225,000 gallons) is located in the gasoline product area (Figure 13-1). Appendix 13.II contains the design standards used to construct the tank. The tank is designed to safely receive the waste from three leaded product tank cleanings per year; however, historically only one product tank per year has been cleaned. The plate steel is placed on the following double lined base, from tank bottom to natural compacted soil:

- Steel tank bottoms - 3/8 inch steel plate
- 2 inches oiled sand, well packed
- 2 inches road mix asphalt
- 6 inches sandy clay, well packed
- 1 inch, Sch 80 PVC perforated leak detection pipe
- 20 mil PVC liner
- 4 inches sandy clay, well packed
- 4 inches 3/4 inch road mix silts
- Compacted natural soil

The leak detection and collection piping is between the asphalt and PVC liners. Drawing 10020000090 (Appendix 13.I) provides the construction details for this facility.

Based on thirty years experience at this facility and more than 50 years industry experience, leaded tank bottom sludge is not corrosive. However, Exxon and industry standard practice is to maintain a minimum shell thickness of a steel

tank at 0.125 inches. Therefore, the corrosion allowance is 0.125 inches. The entire facility is designed and constructed in accordance with Exxon Engineering Standards (Appendix 13.II). Basic design data are as follows:

- Tank dimensions - 100' x 100' x 3'
- Tank capacity - 30,000 ft.^{3} - 225,000 gallons
- Wall thickness - 1/4 inch steel plate with stiffeners
- Bottom thickness - 3/8 inch steel plate on double liner
- Maximum amount of waste treated per year - 30 yd.^{3}
- Maximum volume of waste - 6075 gallons

Approximately 80 percent of this waste is water, and this water evaporates leaving the actual leaded waste only one half to one inch deep in the tank. As a worst case, the tank is designed to have at least a two foot freeboard. It is expected that normal operations will have between 2 1/4 and 2 3/4 foot of free board. During a normal year when only one tank is cleaned, the leaded waste in the weathering tank would be less than one half inch deep.

The lead weathering tank is inside the product storage area, which is totally enclosed by a dike system. Procedures for handling oil spills are described in the refinery SPCC plan.

13.10 PIPING, INSTRUMENTATION, AND PROCESS FLOW

13.10.1 Lead Weathering Tank

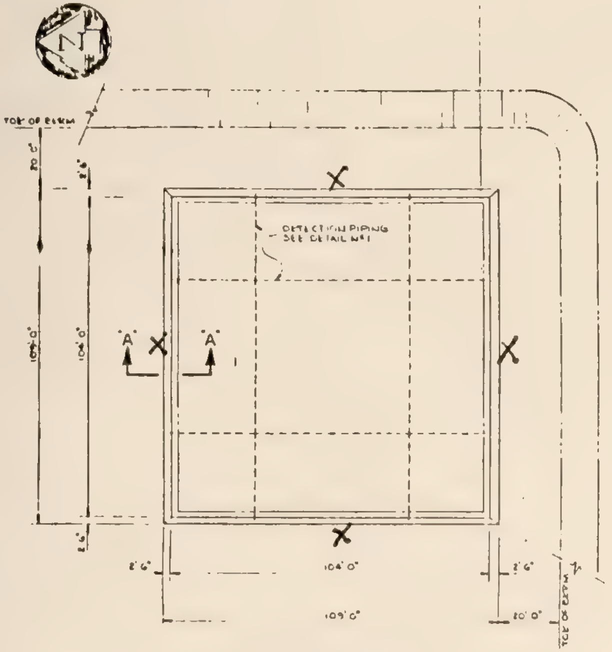
The lead weathering treatment tank is a batch system and has no piping or instruments associated with it. Wastes are collected from the cleaned product

tanks by a vacuum truck and discharged directly into the lead weathering tank. The vacuum truck operator controls the flow of waste into the tank. As previously discussed, the tank will never contain more than a few inches of material; therefore, the tank will never be overfilled with waste. The tank will be inspected prior to cleaning a product tank to insure that the lead weathering tank will hold the contents of the cleaned tank and that sufficient freeboard is available to prevent overtopping. The weathered waste will be removed by clam shell or manual methods using approved personnel safety standards.

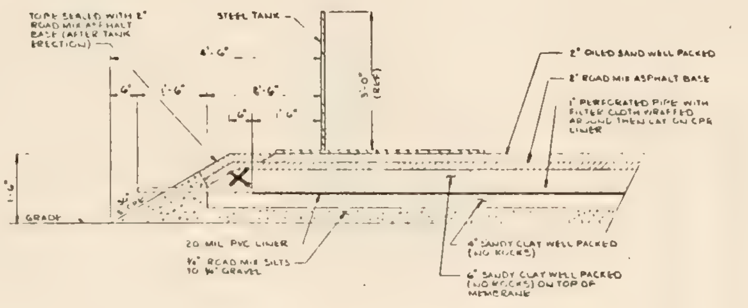
13.11 TANKS HOLDING INCOMPATIBLE, IGNITABLE, OR REACTIVE WASTES

The refinery does not have reactive wastes. No incompatible or ignitable wastes are treated at the lead weathering tank.

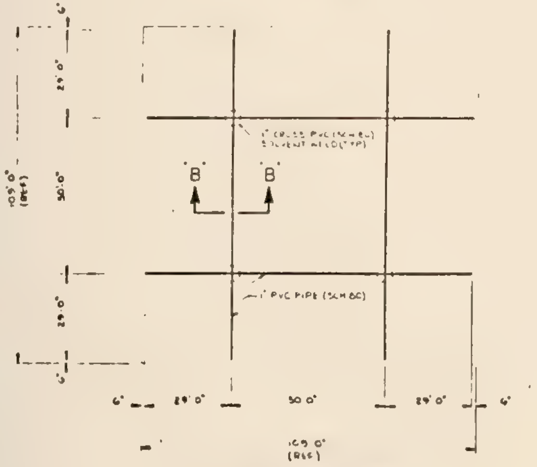
ATTACHMENT IIIb4 i



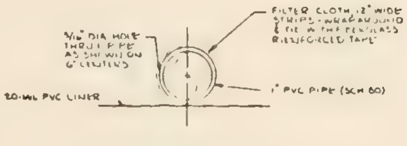
PLAN - VIEW
LEAD WEATHERING PAD
SCALE: 1" = 20'0"


TOPE SEALED WITH 2" ROAD MIX ASPHALT BASE (AFTER TANK ERECTION)
STEEL TANK
4'-6"
6"
1'-6"
8'-6"
6"
1'-6"
3'-0" (REF)
1'-6"
GRADE
2" OILED SAND WELL PACKED
2" ROAD MIX ASPHALT BASE
1" PERFORATED PIPE WITH FILTER CLOTH WRAPPED AROUND THEN LAY ON CPE LINER
20 MIL PVC LINER
3/8" ROAD MIX SILTS TO 3/4" GRAVEL
4" SANDY CLAY WELL PACKED (NO ROCKS)
6" SANDY CLAY WELL PACKED (NO ROCKS) ON TOP OF MEMBRANE

SECTION A-A
TYP SECTION THRU TANK FOUNDATION
SCALE 3/8" = 1'-0"



DETAIL Nº 1
LAYOUT OF 1" PERFORATED PIPE
FOR LEAK DETECTION
[illegible]


3/16" DIA HOLE THRU PIPE AS SHOWN ON 6" CENTERS
FILTER CLOTH 12" WIDE STRIPS - WRAP AROUND & TIE W/ FIBERGLASS REINFORCED TAPE
20 MIL PVC LINER
1" PVC PIPE (SCH 80)

SECTION B-B
TYP SECTION FOR LEAK DETECTION PIPING
SCALE: NONE

NOTES
1. REF DWG 100 300 0007 PLOT PLAN

JLM 3-83
JLM 3-83
GFH 1-83
GFH 1-83 3-10-83

J.E. HENGELFELT 3-83
J.L. MILLER 3-83
CHARGE CODE
AR-1866

EXXON COMPANY U S A

RCRA COMPLIANCE PROJEC
LEAD WEATHERING AREA
FOUNDATION, SECTIONS, DETAIL

100200000

ATTACHMENT IIIb4ii

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

JW Beck
J. W. Beck
Registered Professional Engineer Louisiana
L.S.B.R.P.E.L.S - No. 13009 (CE)

7/29/88
Date

My assessment as to the adequacy of the tank design and compatibility of the leaded waste materials to be treated and/or stored were viewed to ensure the tank will not collapse, rupture or fail. This assessment considered:

1. Design standards for Exxon (See Appendix 13.II).

2. Hazardous characteristics of the sludges to be placed in the tank. Construction material is quite compatible.

3. Existing corrosion protection measures are more than adequate at 0.125 inches.

4. The age of the tank is only five years.

5. Visual inspection of the sides indicate little or no corrosion at this time. Routine inspection of the bottom of the tank will be conducted in 1993. There was no evidence of leaking from this above ground tank.

6. Secondary containment (clay lined tank dike) is more than adequate as the total volume of the lead weathering tank is only 224,000 gallons (totally full) and the tank dike is capable of containing about 4,800,000 gallons.

7. The tank is equipped with a leak detection system below the tank bottom and an impermeable liner, compatible with the leaded sludge (a 20 mil PVC liner) below the leak detection system. The liner has sufficient strength and thickness to prevent failure owing to pressure gradients, physical contact with the waste, climatic changes or stress of daily vehicular traffic.

8. The tank foundation and base are capable of providing support to the tank and its contents without causing the tank to fail due to settlement, compression, or uplift.

9. The sloped leak detection system is designed and operated to detect any leak of hazardous waste or accumulated liquid in the secondary containment dike at the earliest practicable time, considering leak size, location, and propensity to flow.

10. The secondary containment dike (6 feet high, 8-12 feet at the bottom, and 2-3 feet at the top) is designed to contain more than 100% of the largest tank (3,800,000 gallons) as well as prevent run-on or infiltration of precipitation. Additional capacity is in excess to contain a 25 year, 24 hour rainfall event.

11. There are no other ancillary equipment.

8.1.1 Waste Staging Area

In the waste staging area, concrete or asphalt ramps are provided (see Drawing No. 03230100010, Appendix 13.I) so that vehicles can enter the area and operate with maximum safety, thus minimizing the hazards during loading and unloading operations.

A forklift is used to transport properly labeled D.O.T. approved waste containers in the waste staging area. Containers are placed on pallets after being filled in the process area. The pallets are then picked up by the forklift and transported to the waste staging area. Forklift speeds are limited to five miles per hour, and forklift operators are not allowed to smoke when operating the forklift. Palletized drums containing non-hazardous solids may be stacked two high such that a maximum of eight drums (four drums on each pallet) can be transported at one time. Only experienced, properly-trained personnel are allowed to handle these wastes and operate the forklifts.

When approximately one truckload of stored waste has accumulated in the waste staging area, a hazardous waste transporter is called to remove the stored waste to off-site disposal. The forklift will be used to load the drums onto the waste transporter's trucks. Applicable waste transport manifesting procedures for shipments to Chem-Security Systems are included as an example of what may be applicable for hazardous waste transport.

All containerized waste is handled in the above manner. All waste containers are closed except when filling the container.

8.1.2 Treatment Tanks

Leaded tank bottom wastes are removed from the tanks using a vacuum truck and transported to the lead weathering tank where the truck is emptied into the weathering tank. The vacuum truck is inspected on a regular basis to insure that the truck will not leak or spill. Vacuum truck inspection includes internal testing and a 50 psig hydrostatic test. Strict safety precautions are enforced during these inspections.

ATTACHMENT IIIb6

Table 5-1. INSPECTION SCHEDULE FOR THE HAZARDOUS WASTE FACILITIES AT THE EXXON BILLINGS REFINERY

Area/Equipment	Specific Item	Type of Problem	Frequency of Inspections
Safety and Emergency Equipment	Standard industrial absorbents	Low stock	Monthly/as needed
	Pumps	Power, clogging	Monthly
	Flexible hoses with quick couple fittings	Cracks or holes, fittings stick	Monthly
	55 gallon drums (steel, stainless steel)	Corrosion, structural damage	Monthly
	Face shields	Broken or dirty equipment	Monthly
	Fire and safety equipment	-----------	Per Exxon Safety Inspection Schedule
	Protective clothing	Holes, normal wear and tear	As used
Security Devices	Refinery perimeter, fences and gates	Corrosion, damage to chain-link fence or barbed wire	Daily
	Refinery perimeter, warning signs	Missing, damaged	Daily
Waste Staging Area	Concrete pads and curb walls	Cracks, liquids standing, signs of leaks	Weekly
	Sumps	Cracks, liquids standing	Weekly and after storms

Tabl 1. (Concluded)

Area/Equipment	Specific Item	Type of Problem	Frequency of Inspections
	Pumps	Power, clogging	Monthly, if in use
	Containers	Leaks, container in poor condition. Container not closed. Corrosion, placement	Weekly
	Fence and warning signs	Fence secure. Signs in place and visible.	Weekly
Lead Weathering Tank	Tank	Corrosion, discoloration, cracks, etc.	Weekly
	Tank pad	Cracks, spills	Weekly
	Dike	Leakage, erosion, deterioration	Weekly
	Fence	Secure, gate locked	Daily
	Warning signs	Present, visible	Daily
	Freeboard	Insufficient freeboard	Daily
Land Treatment Areas	Warning signs, fences	Security	Daily
	Dikes	Leakage, erosion	Weekly

ATTACHMENT IIIb7

EXHIBIT 5-5A

DAILY FACILITY INSPECTIONS OF PERIMETER FENCE AND LEAD WEATHERING TANK FREEBOARD

Date and Time:

Waste Container Staging Area

		Yes	No
1.	Is Refinery perimter fence secure and in good condition?	____	____

East Land Treatment Area

1.	Is perimeter fence secure and in good condition?	____	____

South Land Treatment Area

1.	Is perimeter fence secure and in good condition?	____	____

Lead Weathering Tank

1.	Is perimeter fence secure and in good condition?	____	____
2.	Is there at least two feet of freeboard?	____	____

Repairs or attention needed (specify):

Remedial action taken:

Additional Observations:

I have inspected these facilities and noted any discrepancies:

Inspector ______________________________

Return daily to Process Secretary

ATTACHMENT IIIb8

Exhibit 5-8

Date and Time: ________ ________ ________ ________

Lead Weathering Tank Area
Inspect Once Per Week

	Yes or No			
1. Dikes show no signs of leakage, erosion, or deterioration.				
2. Warning signs are present and visible.				
3. Tank shows no signs of leakage.				
4. No signs of spills around tanks.				
5. Cracks in tank pad.				

NOTE: Return to Process Stenographer

If inspections of the Exxon Billings facilities reveal that a hazard is imminent or has already occurred at any time between inspections, remedial action will be immediately undertaken. Exxon personnel will immediately notify the appropriate authorities listed in the Contingency Plan (Section 6.0) and initiate the remedial action. In the event of an emergency involving the release of hazardous substances in the environment, efforts will be made to contain the hazard, remove it, and decontaminate the affected area. A detailed description of emergency response procedures is included in the Contingency Plan. If inspections reveal that non-emergency maintenance is needed, it will be completed as soon as possible to prevent any further damage.

Only visual inspection results for each hazardous waste management unit are recorded on inspection sheets which are placed in the facility operating record. Each log sheet contains the date and time of inspection, name of inspector, notation of the observances made, and the date and nature of any repairs or other remedial actions. Sample log sheets are included in Exhibits 5-6 through 5-8. The inspection log sheets are maintained for all units in the Process Department Files (RCRA Operating Record-Inspections). The log sheets from each treatment unit will be inserted at least annually in the facility operating records. As required by 40 CFR 264.15, inspection records are kept at least 3 years from the date of inspection.

The lead weathering tank is thoroughly inspected for shell thickness using ultrasonic or similar techniques during turnaround. The tank is inspected at least every ten years, which is consistent with normal refinery inspection procedures. This ten year interval is typical of experience throughout the industry for tanks in service like this. Target minimum shell thickness of 0.125 inches is an industry standard for tanks and ensures adequate strength until thinned steel area can be repaired. Tank bottom thickness can be determined with a pit-gauge caliper to determine localized pit corrosion. The same minimum thickness of 0.125 inches applies. An external inspection by ultrasonic tests may be conducted at five year intervals between the 10 year period of major inspection. For thorough inspection, the tank is completely emptied of all solid hazardous wastes into barrels using shovels, steel and soft brooms. The tank is then washed with water and the water collected by vacuum truck for disposal into the dirty water sewer. Shovels and brooms are barrelled for disposal at a Class I facility. Internal inspection can then proceed.

No post closure care of the Waste Staging Area is required because all hazardous wastes and hazardous waste residue will be removed from the facility.

11.1.6 Closure and Post Closure of the Lead Weathering Tank

The following procedure will be used to close the Lead Weathering Tank:

A. Cease receiving waste.
B. Allow water to evaporate from last waste.
C. Remove waste residue from tank and ship to off-site disposal.
D. Wash tank.
E. Evaporate wash water.
F. Wash tank and remove wash water.
G. Dismantle tank.
H. Submit a section of tank shell or floor for laboratory testing EP Toxic lead using the EP Toxicity test methods in 40 CFR 261, Appendix II. If less than 5.0 ppm EP Toxic lead, tank is non-hazardous and may be disposed of as non-hazardous.
I. Obtain composite soil sample of material between tank bottom and liner using a 20' x 20' grid (25 samples) conduct EP toxicity analysis 40 CFR 261. If less than 5.0 ppm EP toxic lead no ground contamination has occurred.
J. Dismantle liner system and dispose as non-hazardous.
K. Regrade and revegetate.
L. Note: If lead contamination is found contaminated soil will be removed and disposed of at proper disposal facility.

Equipment required for closure of the Lead Weathering Tank would include:

- Miscellaneous tools
- Vacuum truck
- Waste transportation vehicle
- Welder
- Crane and truck
- Dozer or grader

No post closure care of the Lead Weathering Tank is required because all hazardous waste will be removed from the facility. The tank itself will be non-hazardous due to the washing procedures.

11.1.7 Closure of Land Treatment Areas

The following procedures will be used to close the Land Treatment Areas:

A. Closure will begin upon receipt of the last load of waste.

B. Normal operating procedures will be followed for a minimum of one year after the receipt of the last load of waste to allow degradation.

C. During the stabilization period soil core, lysimeter (soil pore), and ground water samples will be collected to verify when biodegradation is complete and ensure no contamination has taken place.

D. Lime will be spread on the land, if necessary, to maintain the pH between 7 and 8.

NOTE: As oily wastes degrade, there is the remote possibility of wind dispersal. Trees and geographic location of the treatment areas prevent a significant impact. Also due to the short time period between final waste application and addition of top soil (E) exposure to excessive dispersal is negligible. In addition, the Erosion Wind GP values presented in Table 14.22 indicate susceptibility to erosion is quite low. Therefore, no additional wind dispersal control is necessary.

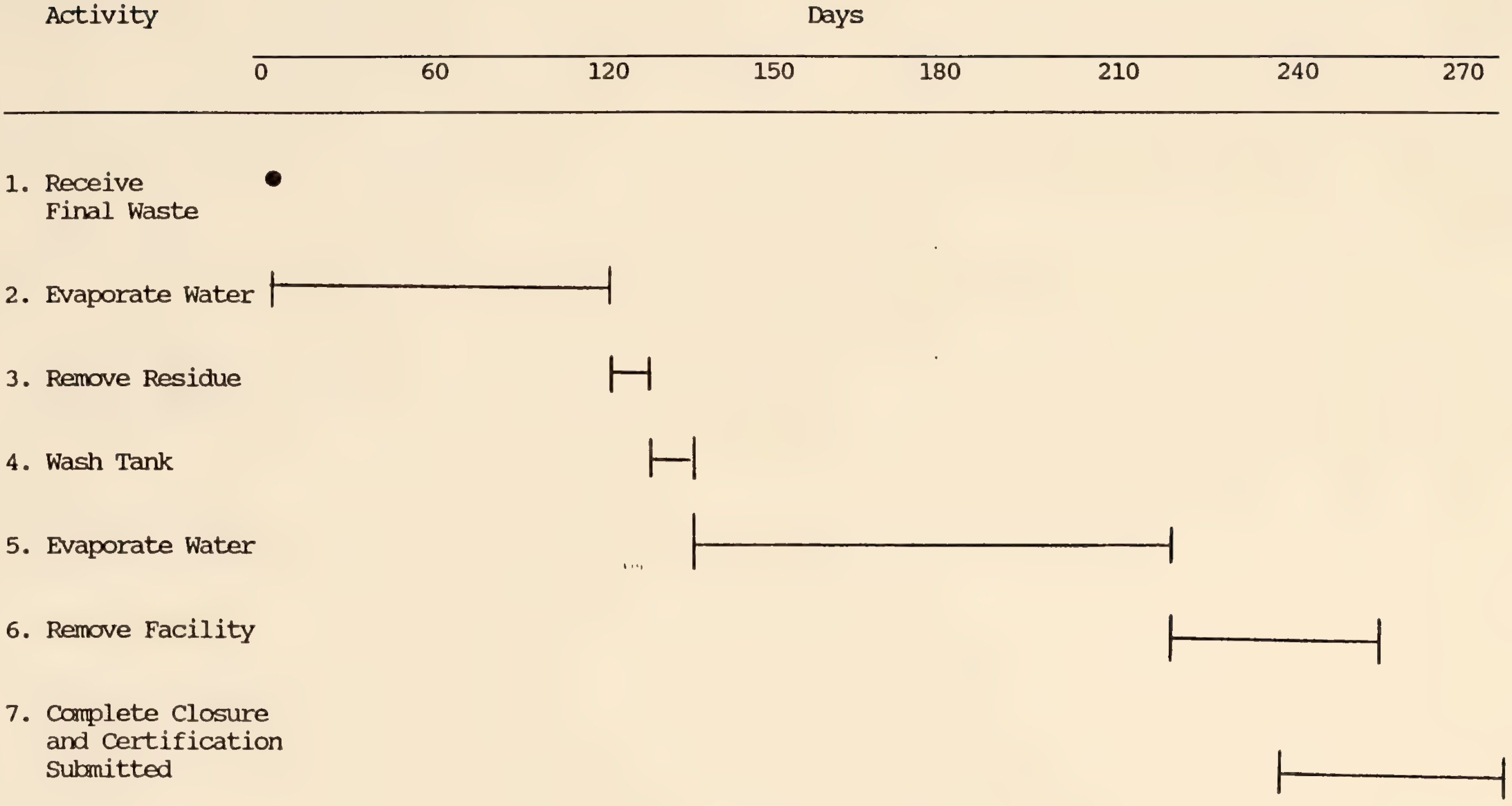
E. The Land Treatment Areas will be covered with 6 inches of topsoil.

F. Topsoil will be graded to approximately 1 percent for drainage.

G. The topsoil will be fertilized and revegetated with Western Wheatgrass (agropyron smithii), or an equivalent crested wheatgrass sodforming variety to prevent erosion and inhibit infiltration of rain water.

Figure 11-2.

SCHEDULE FOR CLOSURE -
LEAD WEATHERING TANK



MODULE IIIc

WASTE STAGING AREA

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Module IIIc - Waste Staging Area

A. APPLICABILITY

The requirements of this Permit Module apply to the operation of the waste staging area at the facility, at which hazardous wastes are stored in containers. The Permittee must operate and maintain the waste staging area in accordance with this Permit, applicable requirements in Title 16, Chapter 44, ARM, and as specified in the Application.

B. PERMITTED WASTES

Refer to Attachment IIIc1. Hazardous wastes routinely stored in containers at the waste staging area include:

EPA Hazardous Waste Number	Hazardous Waste
F001	- spent halogenated solvents
F003	- spent non-halogenated solvents
D010	- spent diethanolamine cartridge filters (selenium levels elevated)
D002	- HF (hydrofluoric) acid tar (corrosive)

Wastes less frequently generated, or that may be generated on a one-time basis only, which may be stored in containers at the waste staging area in accordance with all other conditions in this Module include:

- hazardous material spill clean-up residues
- hazardous laboratory waste
- paint wastes
- caustic soaked insulation
- other wastes determined to be hazardous when evaluated as in Attachment IIIc2

C. OFFSITE WASTES

The Permittee shall not receive, store, or process hazardous wastes generated offsite at the waste staging area.

D. WASTE ANALYSIS

The Permittee is not required to perform routine waste analysis on those listed and characteristic wastes that are routinely generated, and subsequently stored at the waste staging area. These wastes include F001 and F003 solvent wastes, spent DEA cartridge filters (D010), and HF acid tar (D002). Records of all analyses performed either as a random check by the Permittee or as requested on a case-by-case basis by a hazardous waste transporter or receiving facility, shall be kept as part of the operating record. Waste material profile sheets required by the Permittee's hazardous waste contractor shall also be incorporated into the operating record.

Wastes infrequently generated, and wastes resulting from spilled substances not wasted under normal operating conditions, shall be analyzed as they are generated to determine if they are hazardous, concurrent with storage of the waste staging area. Analyses are performed in accordance with the Waste Analysis Plan presented in Section 4.2 of the Application, and as outlined in Attachment IIIc2. In all cases, test methods will conform to Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, EPA 1986, (SW-846).

E. PERMITTED UNIT

The waste staging area is located within the Exxon Billings Refinery, Yellowstone County Montana, T.1N, R.26E, Section 25. Attachment IIIc3 indicates its general location within the refinery.

The waste staging area has been constructed as described in Attachment IIIc4, and as illustrated in Attachments IIIc5, IIIc6, IIIc7, and IIIc8.

Within the waste staging area there is a palletized drum storage pad with a non-discharging sump, a drum crusher pad with a non-discharging sump, a safety building, and segregated storage areas for spent catalyst, HF contaminated piping, insulation, and empty drums. Any changes to the waste staging area that would affect hazardous waste management practices shall only be made following permit modification as described in ARM 16.44.116 or ARM 16.44.118.

F. CONTAINMENT

1. The containment system shall be operated as described in Attachment IIIc9, which are Sections 13.3 through 13.7 in the Application. At a minimum, the system shall meet the following requirements of 40 CFR 264.175, as incorporated by reference in ARM 16.44.702:

    a. A base must underlie the containers, which is free of cracks or gaps and is sufficiently impervious to contain leaks, spills, and accumulated precipitation until the collected material is detected and removed;

    b. The base must be sloped or the containment system must be otherwise designed and operated to drain and remove liquids resulting from leaks, spills, or precipitation, unless the containers are elevated or are otherwise protected from contact with accumulated liquids;

    c. The containment system must have sufficient capacity to contain 10% of the volume of containers or the volume of

the largest container, whichever is greater. Containers that do not contain free liquids need not be considered in this determination;

d. Run-on into the containment system must be prevented unless the collection system has sufficient excess capacity in addition to that described in (c) above to contain any run-on which might enter the system;

e. Spilled or leaked waste and accumulated precipitation must be removed from the collection area in as timely a manner as is necessary to prevent overflow of the collection system.

The Permittee shall follow the procedures on page 13-11 of Attachment IIIc9 for determining the potential hazardousness of collected liquids and shall dispose of them accordingly. The operating record must show the results of the tests and the actions taken to dispose of any residual liquid.

2. As described on page 13-5 of Attachment IIIc9, all hazardous wastes stored at the waste staging area shall be stored in areas with secondary containment, except for HF contaminated piping which is packaged and stored in a separate area.

G. OPERATION OF THE WASTE STAGING AREA

1. General Conditions

The Permittee shall maintain and operate the facility to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous constituents to air, soil, or surface water which could threaten human health or the environment.

2. Condition of Containers

If a container holding waste is not in good condition (e.g., severe rusting, bulging, apparent structural defects) or if it begins to leak, the Permittee shall transfer the hazardous waste from such container to a container that is in good condition, or otherwise manage the waste in compliance with the Conditions of this Permit.

3. Compatibility of Waste with Containers

In accordance with 40 CFR 264.172 as incorporated by reference in ARM 16.44.702, the Permittee must use a container made of, or lined with, materials which will not react with and are otherwise compatible with, the hazardous waste to be stored, so that the ability of the container to contain the waste is not impaired.

4. Management of Containers

In accordance with 40 CFR 264.173, as incorporated by reference in ARM 16.44.702:

a. A container holding hazardous waste must always be closed during storage, except when it is necessary to add or remove waste.

b. A container holding hazardous waste must not be opened, handled, or stored in a manner which may rupture the container or cause it to leak.

5. Specific Operations

All other operations for management of hazardous wastes at the waste staging area shall be performed as described in

Section 13.0, Specific Requirements for Containers and Tanks, in the Application and in Attachment IIIc10. Attachment IIIc10 describes loading and unloading procedures in the waste staging area.

H. SPECIAL REQUIREMENTS FOR IGNITABLE OR REACTIVE WASTE

In accordance with 40 CFR 264.176, as incorporated by reference in ARM 16.44.702, the Permittee shall not locate containers holding ignitable or reactive wastes within 15 meters (50 feet) of the facility's property line.

If such wastes are stored on the palletized drum storage pad, they shall be separated from other containerized wastes by an aisle of at least 10 feet, as discussed under Section 13.8 of Attachment IIIc9, and as illustrated in Attachment IIIc11.

I. SPECIAL REQUIREMENTS FOR INCOMPATIBLE WASTE

In accordance with 40 CFR 264.177, as incorporated by reference in ARM 16.44.702, the Permittee:

1. Shall not store incompatible wastes in the same container.

2. Shall not place hazardous waste in an unwashed container that previously held an incompatible waste or material.

3. Shall separate containers of incompatible wastes as indicated in Attachment IIIc11, and as required by 40 CFR 264.177(c), incorporated by reference in ARM 16.44.702.

J. INSPECTION OF THE WASTE STAGING AREA

The waste staging area shall be inspected weekly for leaks and deterioration of containers or equipment. Sumps, fencing, and

warning signs will also be inspected. Whenever loading or unloading activities are in progress, inspections shall be conducted daily. In addition to weekly inspections, sumps in the waste staging area shall be inspected after storms. Refer to Attachment IIIc12, Inspection Schedule for Hazardous Waste Facilities, and Attachment IIIc13, Waste Staging Area Inspection Log Form. Results of all inspections shall be incorporated into the operating record.

K. RECORDKEEPING AND REPORTING

1. Recordkeeping

a. A written operating record of hazardous waste management activities at the waste staging area must be maintained. Records shall be kept of:

- types and volumes of hazardous wastes stored at the waste staging area

- results of waste analyses

- waste material profile sheets for wastes stored at the facility and shipped offsite

- hazardous waste manifests for wastes stored at the facility and shipped offsite

- results of all inspections

- results of tests and actions taken to dispose of residual liquid from the waste staging area containment system.

b. Additionally, a valid permit, an updated closure plan and closure cost estimates, and any permit modifications relating to the waste staging area must be kept on file.

c. All records required under this Condition must be furnished upon request and made available at all reasonable times for inspection by any duly designated representative of the Department.

2. Reporting

The Permittee shall report to the Department within 24 hours of the occurrence, any leaks, spills, or other non-compliances at the waste staging area that may endanger health or the environment. Details of reporting are outlined in Condition D.13. of Module I of this Permit.

L. CLOSURE

1. Performance Standard

The Permittee shall close the facility as required by 40 CFR 264.111, as incorporated by reference in ARM 16.44.702, in accordance with relevant portions of the closure plan in Attachment IIIc14, and in other relevant sections of the Application. The intent of the waste staging area closure is to leave no wastes, residuals, or contamination in place, therefore long-term post-closure care and monitoring will not be required.

2. Amendment to Closure Plan

The Permittee shall amend the closure plan whenever necessary, in accordance with 40 CFR 264.112(b), as incorporated by reference in ARM 16.44.702.

3. Notification of Closure

The Permittee shall notify the Department at least 180 days prior to the date closure is expected to begin.

4. Time Allowed for Closure

After receiving the final volume of hazardous waste, the Permittee shall remove from the site all hazardous waste, and complete closure activities, in accordance with the schedule shown in Attachment IIIc15.

5. Disposal or Decontamination of Equipment

The Permittee shall decontaminate and/or dispose of all waste staging area equipment as required by 40 CFR 264.114, as incorporated by reference in ARM 16.44.702, and as described in Attachment IIIc13.

The Permittee shall consult with the Department and submit details in writing, before performing any of the activities under items I., J., and K., page 11-7 of Attachment IIIc14. The Department's concurrence shall be required on post-closure sampling locations, methods, and parameters.

6. Certification of Closure

The Permittee shall certify that the facility has been closed in accordance with the specifications in the closure plan, as required by 40 CFR 264.115, incorporated by reference in ARM 16.44.702.

Attachments

Module IIIc

Waste Staging Area

List of Attachments

Module IIIc -- Waste Staging Area

IIIc1	Table 4-1, Hazardous Wastes Handled at the Exxon Billings Refinery
IIIc2	Figure 4-1, Waste Analysis Decision Tree
IIIc3	Figure 13-1, Hazardous Waste Management Unit Locations
IIIc4	Pages 13-1 through 13-4, Containment System for Containers
IIIc5	Appendix 13.I, Waste Staging Area
IIIc6	Appendix 13.I, WSA Catch Basin
IIIc7	Appendix 13.I, Palletized Drum Storage
IIIc8	Appendix 13.I, Drum Crusher Pad
IIIc9	Pages 13-5 through 13-7, Containment
IIIc10	Page 8-2, Loading and Unloading at the Waste Staging Area
IIIc11	Figure 13-2, Ignitable and Incompatible Waste Segregation
IIIc12	Inspection Schedule for Hazardous Waste Facilities
IIIc13	Waste Staging Area Inspection Log Form
IIIc14	Pages 11-1 through 11-8, Closure Plan Excerpt
IIIc15	Figure 11-1, Schedule for Closure

ATTACHMENT IIIc1

Table 4-1. HAZARDOUS WASTES HANDLED AT THE EXXON BILLINGS REFINERY

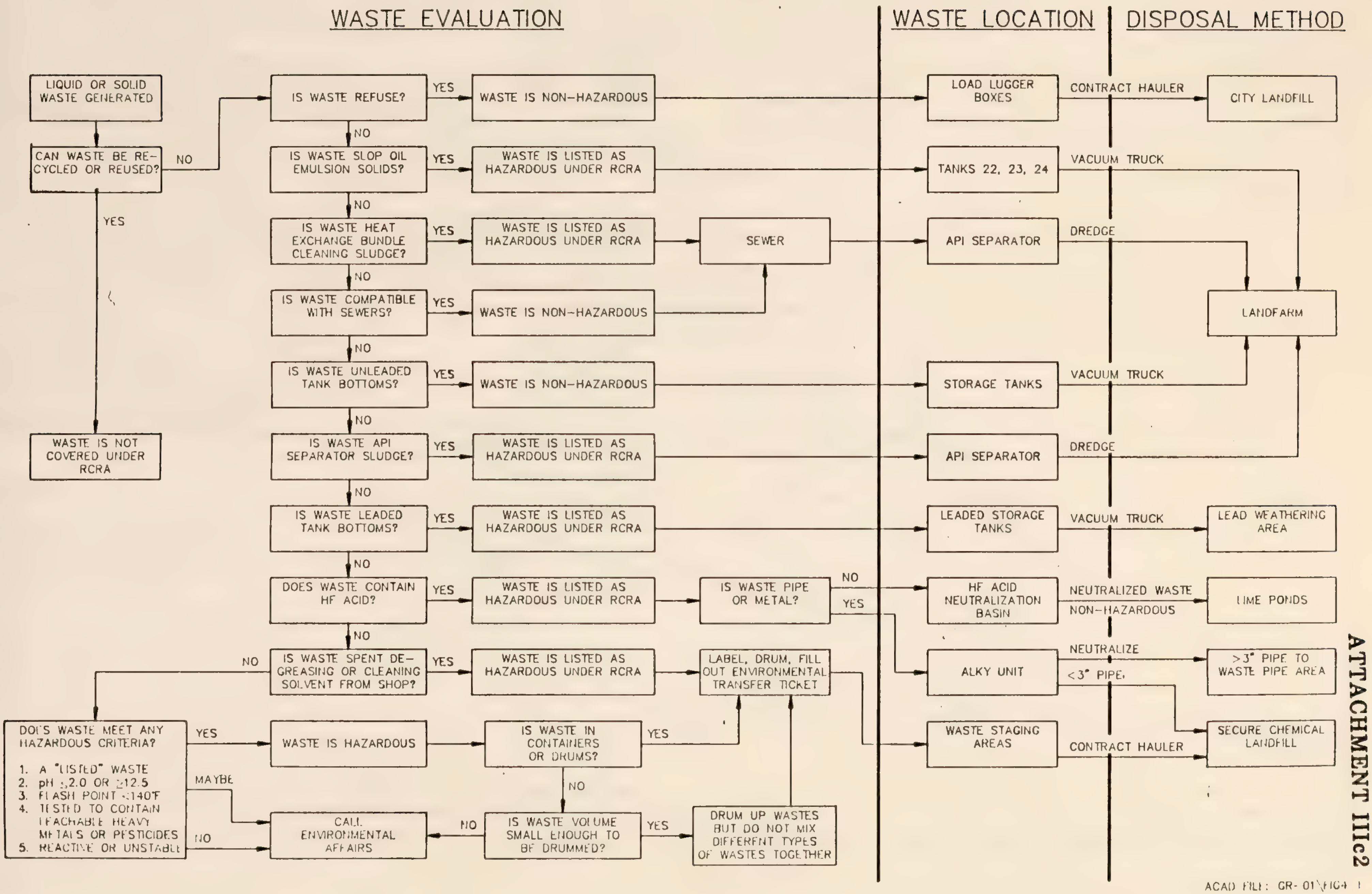
Waste	Hazard	Basis for Hazard Designation	Method of Handling
API Separator Sludge*	Toxic	Listed Waste (K051)	Land Treatment
Slop Oil Emulsion Solids	Toxic	Listed Waste (K049)	Land Treatment
Leaded Tank Bottoms	Toxic	Listed Waste (K052)	Lead Weathering Tank Treatment
HF Acid Tar	Safe Handling	(1)	Closed Container - Waste Staging Area
Hazardous Material Spill Clean-up	To be determined on a case by case basis	Determined on a case by case basis	Land Treatment or Closed Container - Waste Staging Area
DEA Filter Cartrages	Toxic	Determined on a case by case basis	Closed Container - Waste Staging Area
Waste Solvent and Sludges	Toxic	Listed Waste F001, F003	Closed Container - Waste Staging Area

*Includes heat exchanger bundle cleaning sludge (RCRA Listed Waste K050)

(1) This waste presents potential safety problems and hazards, from its fluoride content, for persons sampling and analyzing the sample. Therefore, the waste will not be tested for hazardous criteria but will be disposed to a Class 1 land disposal facility. Its physical characteristic is a tar like substance which would not seep through a paint filter.

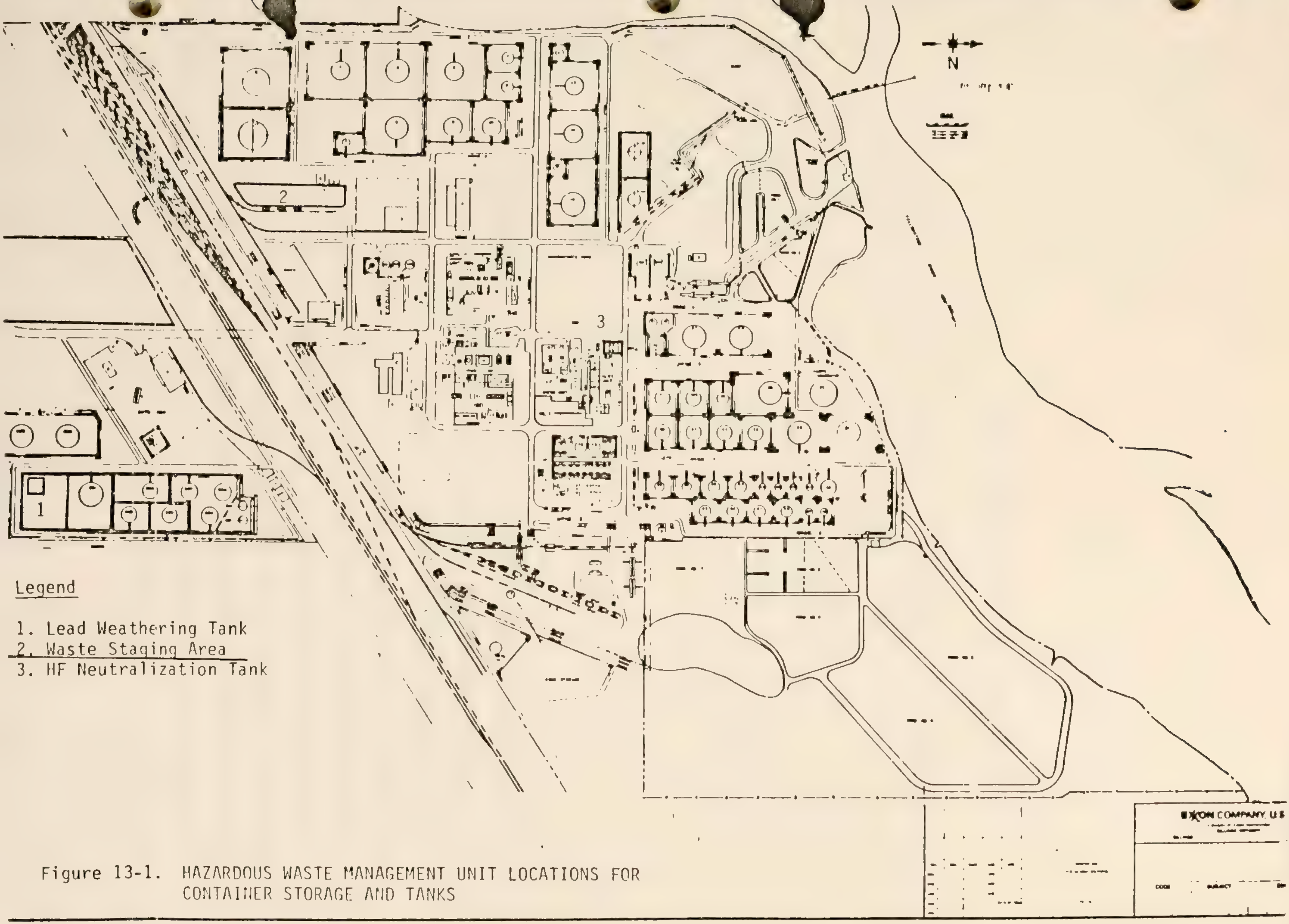
ATTACHMENT IIIc2

FIGURE 4-1: WASTE ANALYSIS DECISION TREE


WASTE EVALUATION
WASTE LOCATION
DISPOSAL METHOD
LIQUID OR SOLID WASTE GENERATED
CAN WASTE BE RECYCLED OR REUSED?
NO
YES
WASTE IS NOT COVERED UNDER RCRA
IS WASTE REFUSE?
YES
WASTE IS NON-HAZARDOUS
LOAD LUGGER BOXES
CONTRACT HAULER
CITY LANDFILL
NO
IS WASTE SLOP OIL EMULSION SOLIDS?
YES
WASTE IS LISTED AS HAZARDOUS UNDER RCRA
TANKS 22, 23, 24
VACUUM TRUCK
NO
IS WASTE HEAT EXCHANGE BUNDLE CLEANING SLUDGE?
YES
WASTE IS LISTED AS HAZARDOUS UNDER RCRA
SEWER
API SEPARATOR
DREDGE
LANDFARM
NO
IS WASTE COMPATIBLE WITH SEWERS?
YES
WASTE IS NON-HAZARDOUS
NO
IS WASTE UNLEADED TANK BOTTOMS?
YES
WASTE IS NON-HAZARDOUS
STORAGE TANKS
VACUUM TRUCK
NO
IS WASTE API SEPARATOR SLUDGE?
YES
WASTE IS LISTED AS HAZARDOUS UNDER RCRA
API SEPARATOR
DREDGE
NO
IS WASTE LEADED TANK BOTTOMS?
YES
WASTE IS LISTED AS HAZARDOUS UNDER RCRA
LEADED STORAGE TANKS
VACUUM TRUCK
LEAD WEATHERING AREA
NO
DOES WASTE CONTAIN HF ACID?
YES
WASTE IS LISTED AS HAZARDOUS UNDER RCRA
IS WASTE PIPE OR METAL?
NO
YES
HF ACID NEUTRALIZATION BASIN
NEUTRALIZED WASTE NON-HAZARDOUS
LIME PONDS
NO
IS WASTE SPENT DEGREASING OR CLEANING SOLVENT FROM SHOP?
YES
WASTE IS LISTED AS HAZARDOUS UNDER RCRA
LABEL, DRUM, FILL OUT ENVIRONMENTAL TRANSFER TICKET
ALKY UNIT
NEUTRALIZE
>3" PIPE TO WASTE PIPE AREA
<3" PIPE
SECURE CHEMICAL LANDFILL
DOES WASTE MEET ANY HAZARDOUS CRITERIA?
1. A "LISTED" WASTE
2. pH ≤2.0 OR ≥12.5
3. FLASH POINT <140°F
4. TESTED TO CONTAIN LEACHABLE HEAVY METALS OR PESTICIDES
5. REACTIVE OR UNSTABLE
YES
MAYBE
NO
WASTE IS HAZARDOUS
IS WASTE IN CONTAINERS OR DRUMS?
YES
NO
IS WASTE VOLUME SMALL ENOUGH TO BE DRUMMED?
YES
NO
DRUM UP WASTES BUT DO NOT MIX DIFFERENT TYPES OF WASTES TOGETHER
CALL ENVIRONMENTAL AFFAIRS
WASTE STAGING AREAS
CONTRACT HAULER

ACAD FILE: GR-01\FIG4-1

ATTACHMENT IIIc3



Legend

1. Lead Weathering Tank
2. Waste Staging Area
3. HF Neutralization Tank

Figure 13-1. HAZARDOUS WASTE MANAGEMENT UNIT LOCATIONS FOR CONTAINER STORAGE AND TANKS

13.0

SPECIFIC REQUIREMENTS FOR CONTAINERS AND TANKS

The information provided in this section is submitted in accordance with the requirements of 40 CFR Part 270.15, and 270.16. Other regulations addressed in this section include 40 CFR Parts 264.17, 264.175, 264.176, 264.177, 264.191, 264.198, and 264.199. Figure 13-1 shows the locations of each of the various hazardous waste units used for storage and treatment of hazardous wastes in containers or tanks. Specific requirements for land treatment of hazardous waste are addressed in Section 14.0.

13.1 DESCRIPTION OF CONTAINMENT SYSTEM FOR CONTAINERS

All waste containers are stored in the area designated as the Waste Staging Area (WSA). The Waste Staging Area is an upgraded waste storage facility and is designed to store wastes in containers. The facility (Drawing 03230100010 in Appendix 13.I) is designed so that all liquids collected on this unit will flow into either individual sumps or the three catch sumps. The catch basins collect any precipitation runoff and direct it to the refinery sewer system and wastewater treatment facilities. The WSA contains a safety building; raised drum crusher pad, with a waste collection sump; a raised palletized drum storage pad, with a waste collection sump; a spent catalyst storage area, a HF contaminated piping storage area, an insulation storage, and an empty drum storage area. The

area is completely fenced with a six ft. high chain link fence having five gate entries around the perimeter. This fenced Waste Staging Area with appropriate warning signs is located inside the secured refinery fenced area. Access inside the refinery fence area is only allowed through the main gate which is manned 24 hours per day by security guards.

The waste staging area is equipped with two elevated fire monitors, both with connecting fire fighting stations. Fire water is provided from the refinery firewater system. The heated safety building will contain the following items:

- Safety shower
- Eye wash
- Storage space for protective clothing, including gloves, rubber boots, face masks and rubber suits
- Dry chemical fire extinguisher
- Fresh air pack
- Storage space for labels and placards used to identify waste containers
- Storage space for absorbent pads, booms, and other spill clean-up equipment

Utilities will include:

- Firewater
- 440 Volt electrical power

13.2 BASIC DESIGN PARAMETERS

13.2.1 Waste Staging Area

The overall size of the waste staging area is approximately 56,400 sq. ft. The waste staging area, except for the palletized drum storage pad, is constructed by placing a minimum of two inches of asphalt over compacted native soil (Drawing 03230100010 in Appendix 13.I). The three catch basins are constructed with six inch thick reinforced concrete and contain a 6 inch drain line to the refinery sewer system. The inside dimensions of each catch basin are 2' x 3' x 4' 4" and the volume of each is approximately 194 gallons (Drawing 03220800030 in Appendix 13.I). All catch basins will be covered with heavy grating to allow traffic passage.

13.2.2 Palletized Drum Storage Pad

All containerized hazardous waste will be stored on the concrete designated as the palletized drum storage pad.

The six inch thick concrete palletized drum storage pad has an area of approximately 10,000 sq. ft. with a 2' x 2' x 2' (60 gallon) non-discharging sump located in the center of the pad. The pad is sloped so that liquids will drain into the sump. The six inch thick reinforced concrete pad has a six inch high reinforced concrete curb wall around the perimeter of the pad, thus making the top of the curb wall one foot above the asphalt paving. The concrete pad is constructed, from ground level to top of pad as follows:

- Native soil
- 4 inches of 3/4" and smaller compacted gravel fill
- 20 mil PVC liner under entire pad including sump
- 2 inches of fine compacted sand
- 6 inch reinforced concrete slab
- 6 inch concrete curb wall

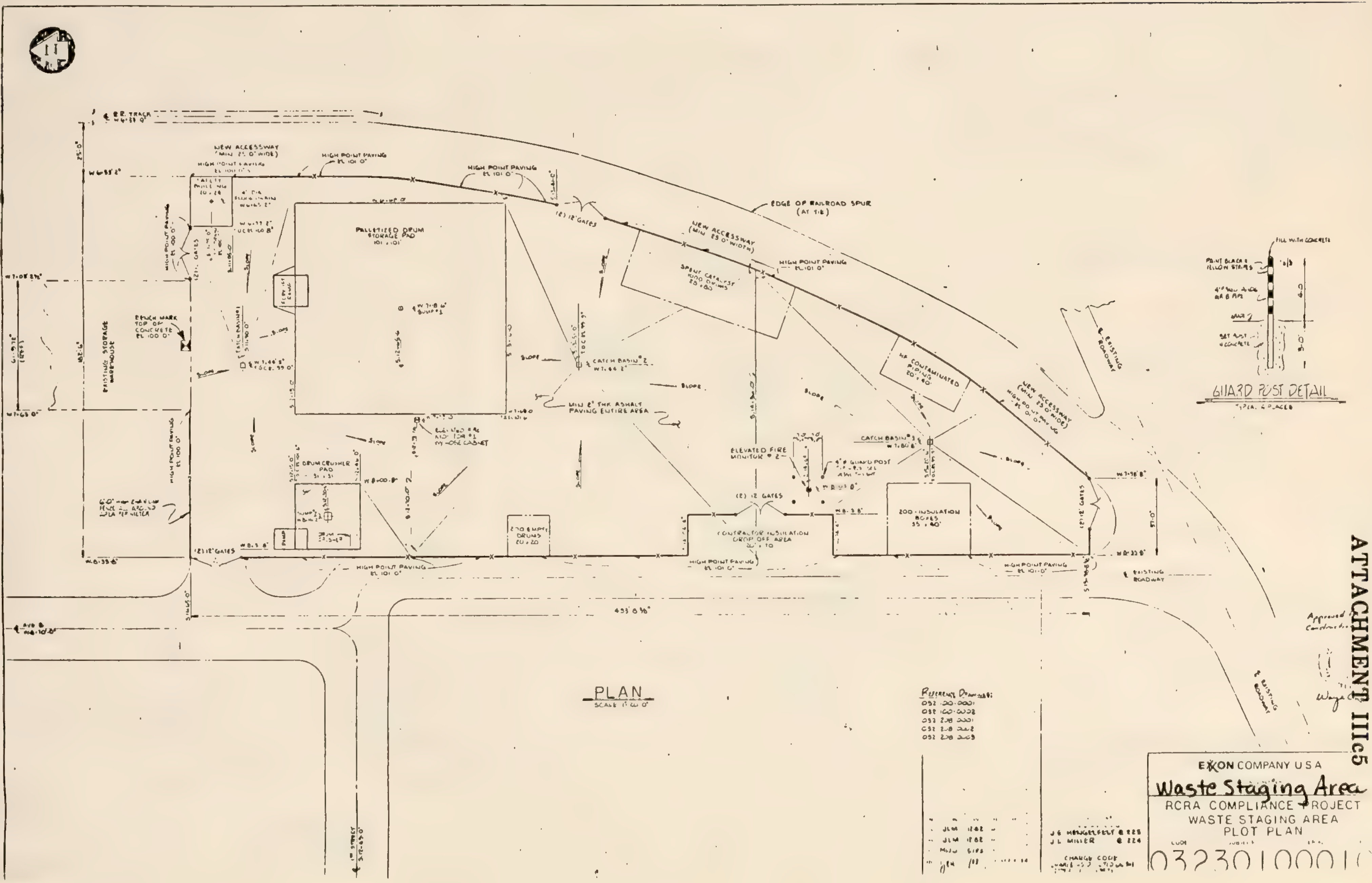
See Drawing 03220800010 for details of pad, sump, and ramp construction. At any one time there will be a maximum of 250 drums (55 gallons) containing wastes on this pad. Wastes stored in this area include small amounts of HF acid tar; spent solvents; unusued chemicals and spent filters. This pad has an access ramp so that fork lifts have easy access into and out of the pad.

13.2.3 Drum Crusher Pad

A drum crusher is located on the drum crusher pad to crush all empty drums before disposal.

The six-inch thick drum crusher pad has an area of approximately 900 sq. ft. with a 4' x 4' x 2' (240 gallon) concrete non-discharging sump located in the center of the pad. The pad is sloped so that liquids will drain into the sump and the six-inch thick reinforced pad has a six-inch high concrete curb wall around the perimeter, thus making the top of the curb wall one foot above the asphalt paving. The concrete pad is constructed in the same manner as the as the palletized drum storage pad. See Drawing 03220800020 in Appendix 13.I for details of construction.

ATTACHMENT IIIc5



℄ R.R. TRACK
NEW ACCESSWAY (MIN 25.0' WIDE)
HIGH POINT PAVING EL 101.0'
SAFETY PAINT LOCKER 10 x 28
PALLETIZED DRUM STORAGE PAD 101 x 101
EXISTING STORAGE WAREHOUSE
BENCH MARK TOP OF CONCRETE EL 100.0'
CATCH BASIN #1
SUMP #1
(2) 12' GATES
EDGE OF RAILROAD SPUR (AT TIE)
NEW ACCESSWAY (MIN 25.0' WIDTH)
SPENT CATALYST 1000 DRUMS 20 x 80
HP CONTAMINATED PIPING 20' x 40'
CATCH BASIN #2
CATCH BASIN #3
MIN 2" THK ASHALT PAVING ENTIRE AREA
SLOPE
ELEVATED FIRE MONITOR #1 W/ HOSE CABINET
ELEVATED FIRE MONITOR #2
4" Ø GUARD POST
DRUM CRUSHER PAD 31 x 31
PUMP
SUMP #2
6'-0" HIGH CHAIN LINK FENCE ALL AROUND AREA PER MILTER
270 EMPTY DRUMS 20 x 20
CONTRACTOR INSULATION DROP OFF AREA 20' x 70
200 INSULATION BOXES 35 x 40'
℄ EXISTING ROADWAY
AVE B
1ST STREET
433' 8 ⅜"
57'-0"
PLAN
SCALE 1" = 40'-0"
GUARD POST DETAIL
TYP. 6 PLACES
FILL WITH CONCRETE
PAINT BLACK & YELLOW STRIPES
4" Ø SCH. 40 CS PIPE
SET POST IN CONCRETE
4'-0"
3'-0"

Reference Drawings:
052-20-0001
052-160-0028
052-208-2001
052-208-2002
052-208-2003

J.G. HENGELFELT
J.L. MILLER

CHANGE CODE

EXXON COMPANY U.S.A.

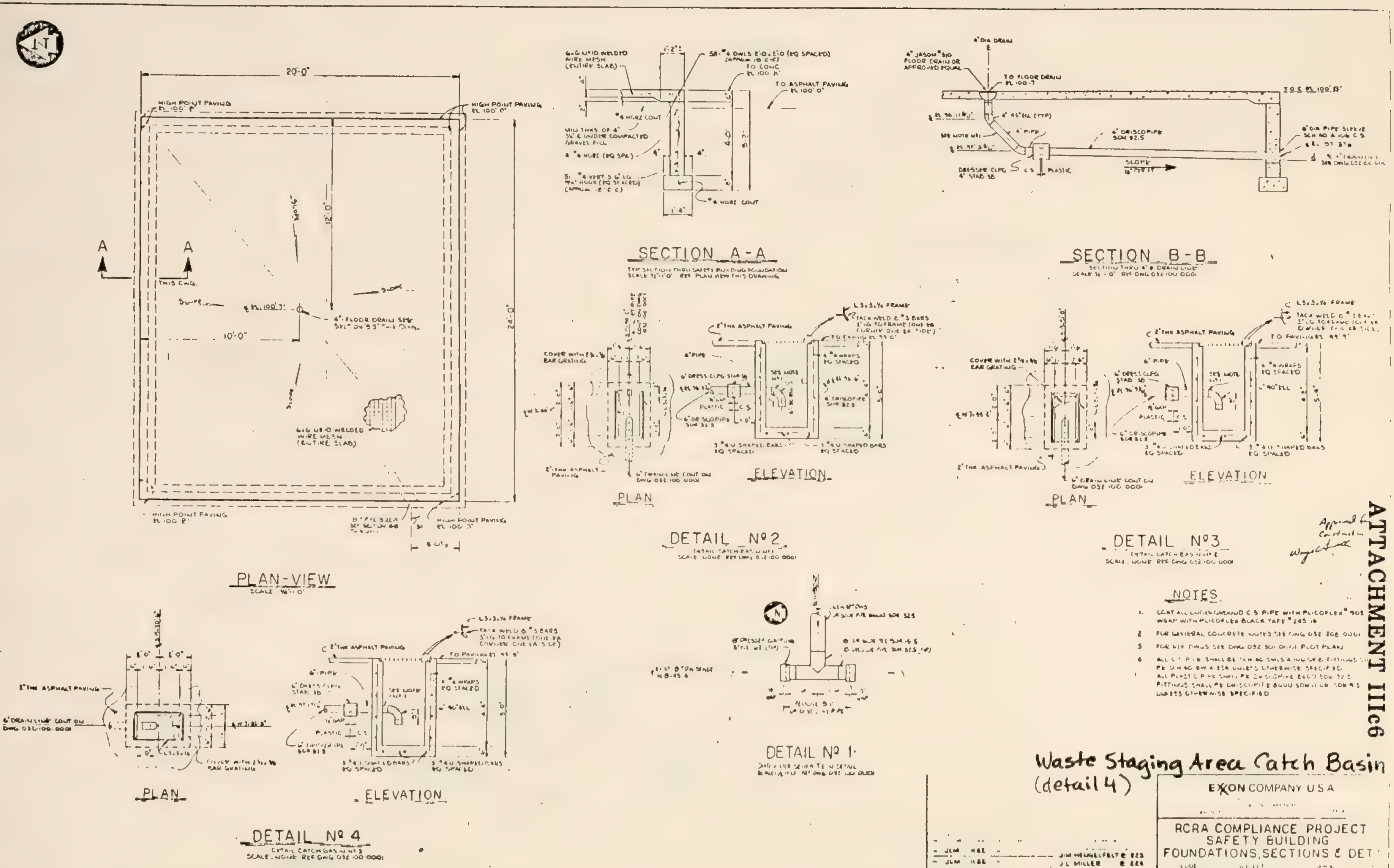
Waste Staging Area

RCRA COMPLIANCE PROJECT
WASTE STAGING AREA
PLOT PLAN

03230100010

Approved

ATTACHMENT IIIc6



NOTES

1. COAT ALL UNDERGROUND C S PIPE WITH PLICOFLEX® 908 WRAP WITH PLICOFLEX BLACK TAPE® 245 16
2. FOR GENERAL CONCRETE NOTES SEE DWG 032 [illegible] 0001
3. FOR ELEV DWGS SEE DWG 032 [illegible] PLOT PLAN
4. ALL C S PIPE SHALL BE SCH 80 [illegible] FITTINGS [illegible] BE SCH 80 BW A 234 UNLESS OTHERWISE SPECIFIED
ALL PLASTIC PIPE SHALL BE [illegible] FITTINGS SHALL BE [illegible] UNLESS OTHERWISE SPECIFIED

Approved for Construction
Wayne [illegible]

Waste Staging Area Catch Basin
(detail 4)

JLM
JLM
JIM [illegible] 225
J L MILLER 224

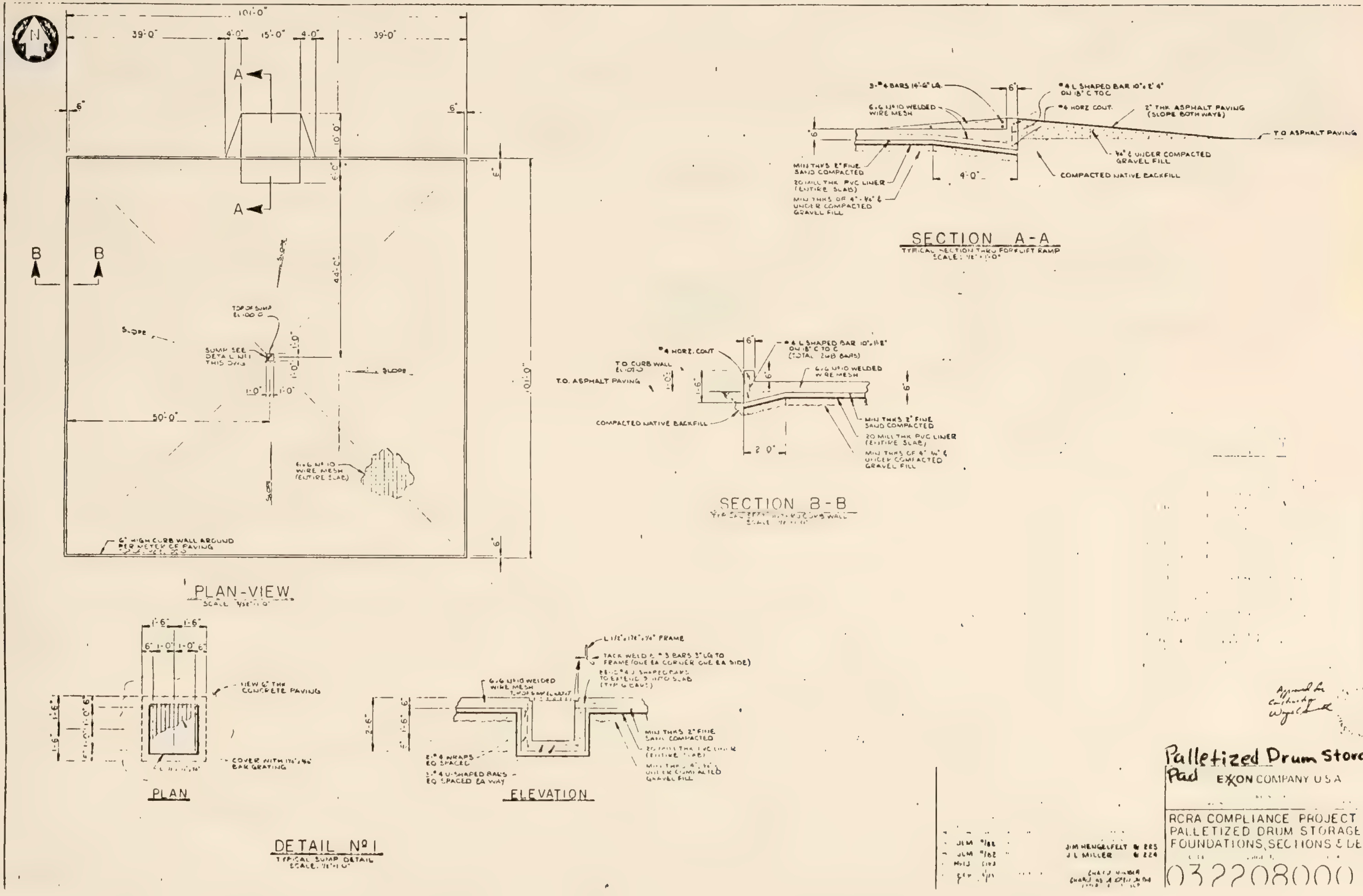
CHANGE CODE

EXXON COMPANY U S A

RCRA COMPLIANCE PROJECT
SAFETY BUILDING
FOUNDATIONS, SECTIONS & DET

03220800031

ATTACHMENT IIIc7


N
101'-0"
39'-0"
4'-0"
15'-0"
4'-0"
39'-0"
6"
6"
10'-0"
6'-0"
A
A
B
B
44'-0"
101'-0"
SLOPE
SLOPE
SLOPE
SLOPE
TOP OF SUMP EL 100.0
SUMP SEE DETAIL Nº1 THIS DWG
1'-0"
1'-0"
1'-0"
1'-0"
50'-0"
6x6 Nº10 WIRE MESH (ENTIRE SLAB)
6" HIGH CURB WALL AROUND PERIMETER OF PAVING
3-#4 BARS 14'-6" LG.
6x6 Nº10 WELDED WIRE MESH
#4 L SHAPED BAR 10"x 2'-4" ON 18" C TO C
#4 HORZ CONT.
2" THK ASPHALT PAVING (SLOPE BOTH WAYS)
T.O ASPHALT PAVING
3/4" ⌀ UNDER COMPACTED GRAVEL FILL
COMPACTED NATIVE BACKFILL
MIN THKS 2" FINE SAND COMPACTED
20 MILL THK PVC LINER (ENTIRE SLAB)
MIN THKS OF 4"-3/4" ⌀ UNDER COMPACTED GRAVEL FILL
4'-0"
6"
#4 HORZ. CONT
#4 L SHAPED BAR 10"x1'-8" ON 18" C TO C (TOTAL 268 BARS)
TO CURB WALL EL 101.0
T.O. ASPHALT PAVING
6x6 Nº10 WELDED WIRE MESH
1'-0"
1'-6"
6"
COMPACTED NATIVE BACKFILL
MIN THKS 2" FINE SAND COMPACTED
20 MILL THK PVC LINER (ENTIRE SLAB)
MIN THKS OF 4" 3/4" ⌀ UNDER COMPACTED GRAVEL FILL
2'-0"
1'-6"
1'-6"
6"
1'-0"
1'-0"
6"
VIEW 6" THK CONCRETE PAVING
COVER WITH 1½"x¾" BAR GRATING
L 1½"x1½"x¼" FRAME
TACK WELD #3 BARS 3" LG TO FRAME (ONE EA CORNER ONE EA SIDE)
6x6 Nº10 WELDED WIRE MESH
2'-6"
1'-6"
6"
2-#4 WRAPS EQ SPACED
3-#4 U-SHAPED BARS EQ SPACED EA WAY
MIN THKS 2" FINE SAND COMPACTED
20 MILL THK PVC LINER (ENTIRE SLAB)
MIN THKS OF 4" 3/4" ⌀ UNDER COMPACTED GRAVEL FILL
JIM 9/82
JLM 9/82
JIM HENGELFELT
J L MILLER

PLAN-VIEW
SCALE 1/32"=1'-0"

SECTION A-A
TYPICAL SECTION THRU FORKLIFT RAMP
SCALE: 1/2"=1'-0"

SECTION B-B
TYPICAL SECTION THRU CURB WALL

PLAN

ELEVATION

DETAIL Nº1
TYPICAL SUMP DETAIL
SCALE: 1/2"=1'-0"

Approved for construction
Wayne

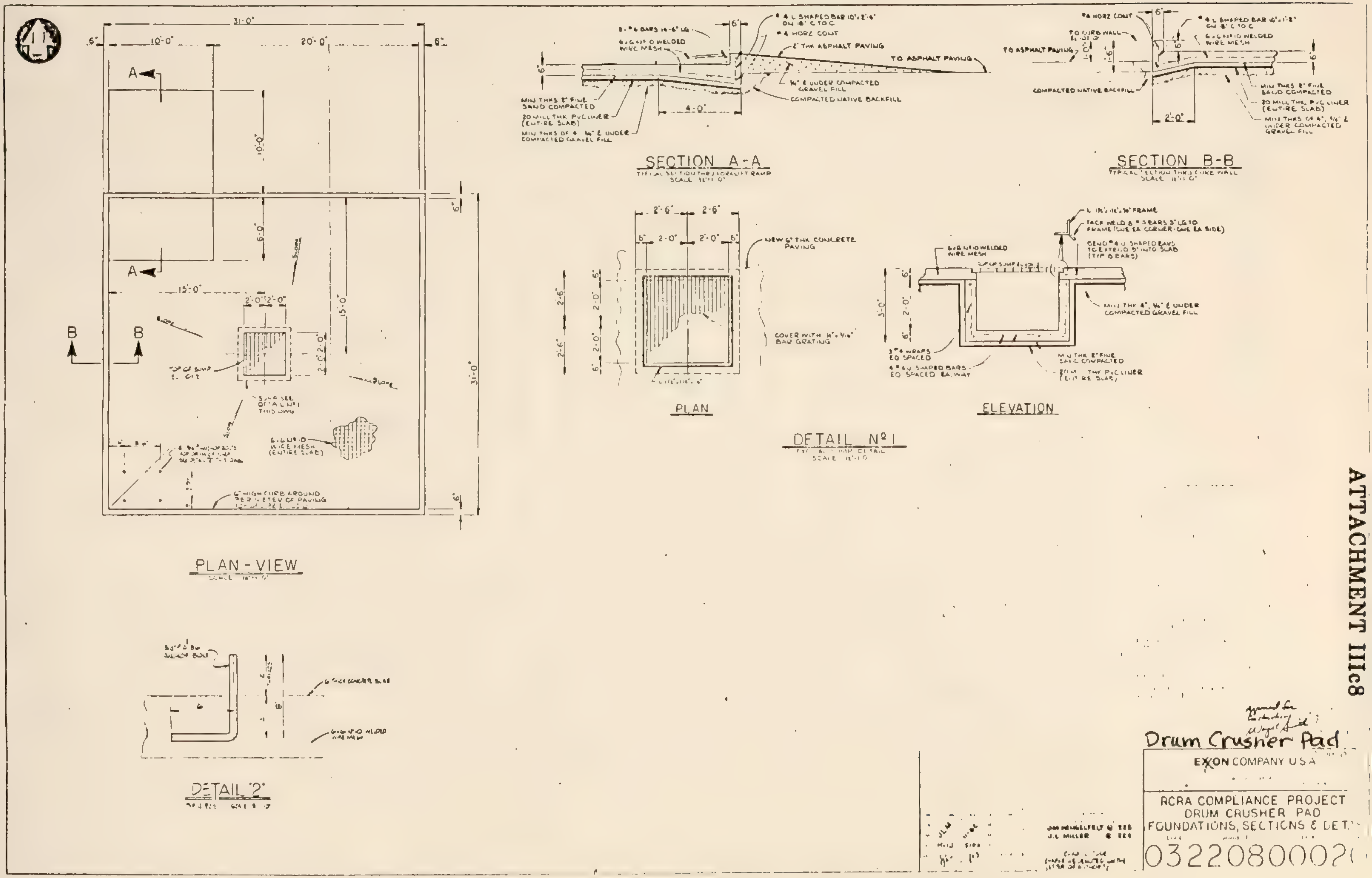
Palletized Drum Storage Pad

EXXON COMPANY U.S.A.

RCRA COMPLIANCE PROJECT
PALLETIZED DRUM STORAGE PAD
FOUNDATIONS, SECTIONS & DETAILS

03220800010

ATTACHMENT IIIc8


31'-0"
6"
10'-0"
20'-0"
6"
A
A
10'-0"
6'-0"
15'-0"
2'-0" 2'-0"
2'-0" 2'-0"
15'-0"
31'-0"
6"
6"
B
B
SLOPE
SLOPE
SLOPE
SLOPE
TOP OF SUMP
SUMP SEE DETAIL Nº 1 THIS DWG
6x6 W10 WIRE MESH (ENTIRE SLAB)
6" HIGH CURB AROUND PERIMETER OF PAVING
PLAN - VIEW
8 - #4 BARS 14'-6" LG
6x6 W10 WELDED WIRE MESH
6"
#4 L SHAPED BAR 10"x2'-6" ON 18" C TO C
#4 HORZ CONT
2" THK ASPHALT PAVING
TO ASPHALT PAVING
¾" Ø UNDER COMPACTED GRAVEL FILL
COMPACTED NATIVE BACKFILL
MIN THKS 2" FINE SAND COMPACTED
20 MILL THK PVC LINER (ENTIRE SLAB)
MIN THKS OF 4" ¾" Ø UNDER COMPACTED GRAVEL FILL
4'-0"
6"
SECTION A-A
TYPICAL SECTION THRU FORKLIFT RAMP
#4 HORZ CONT
TO CURB WALL
TO ASPHALT PAVING
6"
#4 L SHAPED BAR 10"x1'-2" ON 18" C TO C
6x6 W10 WELDED WIRE MESH
COMPACTED NATIVE BACKFILL
MIN THKS 2" FINE SAND COMPACTED
20 MILL THK PVC LINER (ENTIRE SLAB)
MIN THKS OF 4", ¾" Ø UNDER COMPACTED GRAVEL FILL
2'-0"
6"
SECTION B-B
TYPICAL SECTION THRU CURB WALL
2'-6"
2'-6"
6"
2'-0"
2'-0"
6"
NEW 6" THK CONCRETE PAVING
COVER WITH ¾"x3/16" BAR GRATING
PLAN
L 1½"x1½"x¼" FRAME
TACK WELD 8 #3 BARS 3" LG TO FRAME (ONE EA CORNER-ONE EA SIDE)
BEND #4 U SHAPED BARS TO EXTEND 9" INTO SLAB (TYP 8 BARS)
6x6 W10 WELDED WIRE MESH
TOP OF SUMP
MIN THK 4", ¾" Ø UNDER COMPACTED GRAVEL FILL
3'-0"
2'-0"
6"
6"
3 #4 WRAPS EQ SPACED
4 #4 U SHAPED BARS EQ SPACED EA WAY
MIN THK 2" FINE SAND COMPACTED
20 MIL THK PVC LINER (ENTIRE SLAB)
ELEVATION
DETAIL Nº 1
TYPICAL SUMP DETAIL
PLAN - VIEW
6" THICK CONCRETE SLAB
6x6 W10 WELDED WIRE MESH
6
8"
DETAIL '2'
JLM
M.J
J.C. MILLER

Drum Crusher Pad

EXXON COMPANY U.S.A.

RCRA COMPLIANCE PROJECT
DRUM CRUSHER PAD
FOUNDATIONS, SECTIONS & DET
0322080002

13.3 DRAINAGE AND STANDING LIQUIDS REMOVAL

13.3.1 Waste Staging Area

The waste staging area contains the palletized drum storage pad, drum crusher pad, and several areas to store non-hazardous waste. Only non-hazardous waste will be stored in areas that do not have curb walls (Drawing 03230100010). One exception to this is the HF contaminated piping stored in the WSA but outside the curbed areas. This pipe is dipped in a lime solution and packaged in plastic-lined boxes before storing in the WSA. The entire WSA is sloped toward three catch basins that discharge into the dirty water sewer system. Water from precipitation events will be collected in the catch basins and discharged into the wastewater treatment system for treatment. The WSA will be inspected by the warehouseperson on a regular basis. The only time that hazardous waste(s) could be in contact with this area is in the event of a spill while the drums are being transported to or from the palletized drum storage pad. If a spill occurs, the spilled waste will be cleaned up and handled as a hazardous/non-hazardous waste, based on knowledge of the material. Clean-up equipment would likely include absorbent pads, shovels, pumps, etc. Spent absorbent pads would be barreled as hazardous waste, based on knowledge of the material spilled. Cleanup would be under maintenance department supervision after consultation with the Stores Supervisor and Environmental Section in a non-emergency spill. The Emergency Coordinator would supervise an emergency spill cleanup.

13.3.2 Palletized Drum Storage Drum

The palletized drum storage has been designed to store containers holding wastes with and without free liquids. Since both types of wastes are handled, the wastes will all be handled as if the containers held free liquids. It is anticipated that the majority of containers will not contain free liquids. The 100' x 100' concrete pad is surrounded by a six inch high curb wall and the pad slopes toward a central non-discharging sump. All liquids collected inside the curbed area will drain into the sump and all liquids collected from the sump will be removed by pumps for disposal. In adiditon to the pad being sloped toward the sump, the containers will be stored on four inch pallets so that containers will not be in contact with liquids if a spill or leak occurs on the pad.

The area will be inspected at least weekly by the warehouseperson, and if leakage is occurring the situation will be corrected. Any leakage that gets on the pallets, floor, or into the sump, will be removed using absorbent pads, pump(s), and/or other appropriate methods and handled as a hazardous/non-hazardous waste, based on knowledge of the waste.

13.3.3 Drum Crusher Pad

The drum crusher pad is a 30' x 30' concrete pad surrounded by a six inch curb wall. During drum crushing, "empty" drums will be crushed and made ready for disposal. Since some liquid may remain in an "empty" drum, the drum crusher pad is surrounded by a six inch high curb wall and the pad slopes toward a non-discharging sump. All liquids will collect in the sump and be removed by pumps and handled as a hazardous/non-hazardous waste based on knolwedge of the

material. Oily waste liquids will be recovered or disposed of in the land treatment area as directed from the Environmental Section. Other wastes will be placed in containers for shipment off-site.

13.4 SECONDARY CONTAINMENT SYSTEM DESIGN AND OEPRATIONS

13.4.1 Palletized Drum Storage Pad

Drawing 03220800010 (Appendix 13.I) illustrates the design of the secondary containment structure for the palletized drum storage pad. The wastes are stored on four inch pallets placed on an uncracked floor. The floor has a nominal slope of about one-third inch per foot from the curb wall to the sump in the center of the pad. The container stacking plan, which provides for about six inches clear space between lines of containers, permits inspections of the containers for leaks. Leaked waste will be apparent on the exposed parts of the concrete floor. All waste and liquids will be collected in the centrally located sump. The sump has a capacity of eight cubic feet (60 gallons). Waste collected in the sump will be removed by pumping and placed in good containers.

The floor of the storage area and the sump is inspected weekly for evidence of leaked waste and the containers are inspected at least weekly. If leaked waste is noted, the source of the leak is identified. Waste remaining in a leaking contianer will be transferred to a container in good condition. Leaked material will be removed from the exterior of the drums, palllets, floor, and the sump and will be placed in a container.

To contain leaks, spills, and precipitation, a concrete curb wall six inches higher than the concrete floor surrounds the pad. Basic containment design data are as follows:

- Maximize number of stored containers: 250 - 55 gallon drums

- 24 hour, 25 year storm event: 3 inches

- Total storm event volume: 18,750 gallons

- Total containment capacity: 37,500 gallons

- Total quantity of stored waste and storm event: 32,500 gallons
- Sump volume: 60 gallons

- 10% of stored waste: 1375 gallons

- Depth of total quantity of stored waste and storm event:
  32,500 gal/6250 gal/inch = 5.2 inches

- Depth of storm event: 18,750 gal/6250 gal/inch = 3 inches

- Depth of total spill: 13,750 gal/6250 gal/inch = 2.2 inches

- Depth of 10% spill: 1375 gal/6250 gal/inch = 0.22 inches

Based on worst case conditions, i.e., spill of all stored material and a 24 hour, 25 year storm of three inches at the same time, the secondary containment system will contain all the materials. Also, during the 24 hour, 25 year event, all containers would be above the storm water level since these containers are stored on four inch pallets.

In the event of a major spill or rain event, the spilled wastes may be pumped directly to a vacuum truck, sampled, analyzed, and disposed in an acceptable manner. If the waste is not a hazardous waste, it would be disposed into the wastewater treatment system and if it is hazardous, it would be disposed as a hazardous waste. It should be noted that if no containers are leaking at the time of the storm events, and the sump did not contain waste prior to a storm, then the storm water will be discharged from the vacuum truck to the sewer system.

13.4.2 Drum Crusher Pad

Drawing 0322080020 illustrates the design of the secondary containment structure for the drum crusher pad. The drums to be crushed are placed on a concrete floor that is uncracked. The floor has a nominal slope of about one-fourth inch per foot from the curb wall to the sump in the center of the pad. Only "empty" containers, containing one inch or less of liquid, will be on this pad. Immediately after drums are crushed the floor area will be cleaned, the waste collected from the sump, and disposed. The sump has a capacity of 40 cubic feet (300 gallons).

To contain liquids from crushed drums and precipitation, a concrete curb wall six inches higher than the concrete floor surrounds the pad. Basic containment design data are as follows:

- Maximum number of containers: 10 - 55 gallon drums
- Maximum quantity of waste remaining in containers: 20 gallons
- Sump capacity: 300 gallons
- 24 hour, 25 year storm event: 3 inches
- Total storm event volume: 1690 gallons
- Total containment capacity: 3375 gallons
- Total quantity of waste and storm event: 1710 gallons
- Depth of total waste and storm event: 3 inches
- Depth of total spill: contained in sump
- Depth of storm event: 3 inches.

13.5 RUN-ON CONTROL

The curb surrounding both the palletized drum storage pad and the drum crusher is one foot higher than the asphalt paving at the waste staging area.

During a 24 hour, 25 year storm event a maximum of three inches of water could collect on the asphalt paving, if the catch basins or sewer are totally blocked. Since the curb height is 12 inches above the paving, no water can run on the palletized drum storage or drum crusher pads. In addition, most water (excluding drum crusher and palletized drum storage pad) will be drained to the dirty water sewer during a storm event.

13.6 REMOVAL OF COLLECTED LIQUIDS

At both the palletized drum storage pad and the drum crusher, liquids getting on the pads will be collected in the sumps and the liquids will be removed by pumps. If the liquids are a result of spillage, leakage, or drum crushing, it will be assumed that they are the same as the stored waste or the waste originally in the container and they will be handled accordingly (except in the case of a rainstorm without leaks). However, if liquids leak from drums containing different types of material, necessary precautions such as limited liquid analysis (ignitability, color, odor, pH and/or appropriate determination of chemical composition if unknown or not easily determined), as well as checking for compatibility with drum material will be performed to ensure proper re-containerizing for environmentally safe long-term disposal. The sumps will not be allowed to fill up and will be emptied on an as-needed basis. Leak collection will be handled by the maintenance supervisor after consultation with the Environmental Section and Stores Supervisor.

13.7 CONTAINERS WITH FREE LIQUIDS

Both the palletized drum storage pad and the drum crusher pad are designed as though all containers will contain 100% free liquids. No attempt will be made to determine if the containers holding wastes contain free liquids. All containers will be handled as if they contain free liquids. It is anticipated that most of the containers will not contain free liquids, based on Exxon's past experience and expected practice.

13.8 CONTAINERS HOLDING IGNITABLE OR INCOMPATIBLE WASTE

All containers containing wastes are sorted in the WSA. This unit is located within the refinery area and is more than 15 meters (50 feet). from the refinery property line (Figure 13-1). The refinery does not have any reactive or incompatible wastes. Ignitable wastes are rarely stored at the WSA; however, when they are stored, they are separated from other containers by an aisle of at least 10 feet (Figure 13-2). Wastes from sumps are placed in new or clean containers. All containers are clearly marked as to their contents.

13.9 BASIC DESIGN PARAMETERS FOR TREATMENT TANKS

13.9.1 Lead Weathering Tank

The lead weathering tank is specifically designed and constructed to treat wastes rendering them less hazardous. Exposure to atmospheric oxygen oxidizes the organic lead and greatly reduces the hazard associated with the waste. All leaded tank bottoms are placed in the tank and allowed to weather

8.1.1 Waste Staging Area

In the waste staging area, concrete or asphalt ramps are provided (see Drawing No. 03230100010, Appendix 13.I) so that vehicles can enter the area and operate with maximum safety, thus minimizing the hazards during loading and unloading operations.

A forklift is used to transport properly labeled D.O.T. approved waste containers in the waste staging area. Containers are placed on pallets after being filled in the process area. The pallets are then picked up by the forklift and transported to the waste staging area. Forklift speeds are limited to five miles per hour, and forklift operators are not allowed to smoke when operating the forklift. Palletized drums containing non-hazardous solids may be stacked two high such that a maximum of eight drums (four drums on each pallet) can be transported at one time. Only experienced, properly-trained personnel are allowed to handle these wastes and operate the forklifts.

When approximately one truckload of stored waste has accumulated in the waste staging area, a hazardous waste transporter is called to remove the stored waste to off-site disposal. The forklift will be used to load the drums onto the waste transporter's trucks. Applicable waste transport manifesting procedures for shipments to Chem-Security Systems are included as an example of what may be applicable for hazardous waste transport.

All containerized waste is handled in the above manner. All waste containers are closed except when filling the container.

8.1.2 Treatment Tanks

Leaded tank bottom wastes are removed from the tanks using a vacuum truck and transported to the lead weathering tank where the truck is emptied into the weathering tank. The vacuum truck is inspected on a regular basis to insure that the truck will not leak or spill. Vacuum truck inspection includes internal testing and a 50 psig hydrostatic test. Strict safety precautions are enforced during these inspections.

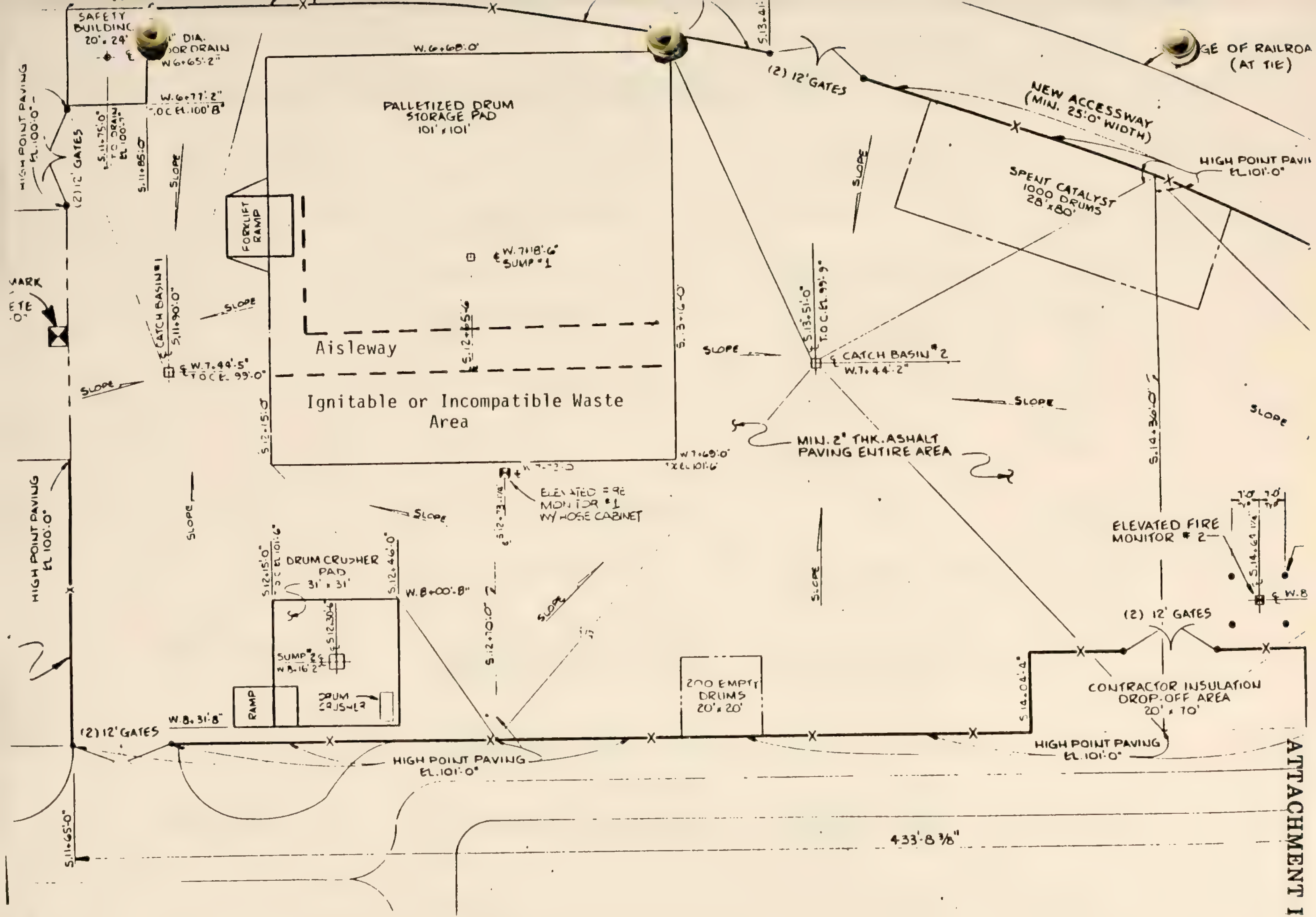


Figure 13-2. IGNITABLE AND INCOMPATIBLE WASTE SEGREGATION

Table 5-1. INSPECTION SCHEDULE FOR THE HAZARDOUS WASTE FACILITIES AT THE EXXON BILLINGS REFINERY

Area/Equipment	Specific Item	Type of Problem	Frequency of Inspections
Safety and Emergency Equipment	Standard industrial absorbents	Low stock	Monthly/as needed
	Pumps	Power, clogging	Monthly
	Flexible hoses with quick couple fittings	Cracks or holes, fittings stick	Monthly
	55 gallon drums (steel, stainless steel)	Corrosion, structural damage	Monthly
	Face shields	Broken or dirty equipment	Monthly
	Fire and safety equipment	-----------	Per Exxon Safety Inspection Schedule
	Protective clothing	Holes, normal wear and tear	As used
Security Devices	Refinery perimeter, fences and gates	Corrosion, damage to chain-link fence or barbed wire	Daily
	Refinery perimeter, warning signs	Missing, damaged	Daily
Waste Staging Area	Concrete pads and curb walls	Cracks, liquids standing, signs of leaks	Weekly
	Sumps	Cracks, liquids standing	Weekly and after storms

Tabl 1. (Concluded)

Area/Equipment	Specific Item	Type of Problem	Frequency of Inspections
	Pumps	Power, clogging	Monthly, if in use
	Containers	Leaks, container in poor condition. Container not closed. Corrosion, placement	Weekly
	Fence and warning signs	Fence secure. Signs in place and visible.	Weekly
Lead Weathering Tank	Tank	Corrosion, discoloration, cracks, etc.	Weekly
	Tank pad	Cracks, spills	Weekly
	Dike	Leakage, erosion, deterioration	Weekly
	Fence	Secure, gate locked	Daily
	Warning signs	Present, visible	Daily
	Freeboard	Insufficient freeboard	Daily
Land Treatment Areas	Warning signs, fences	Security	Daily
	Dikes	Leakage, erosion	Weekly

Exhibit 5-6.

FACILITY INSPECTION LOG FORMS

Date and Time: ________ ________ ________ ________

Waste Staging Area
Inspect Once Per Week

	Yes or No			
1. All containers properly identified.	________	________	________	________
2. No leakage from containers is observed.	________	________	________	________
3. No visible spills in loading and unloading area.	________	________	________	________
4. Cracks in concrete.	________	________	________	________
5. Containers closed.	________	________	________	________

NOTE: Return to Process Stenographer

ATTACHMENT IIIc13

11.0
CLOSURE AND POST CLOSURE

This section is submitted in accordance with the requirements of 40 CFR Parts 270.14(b) (13), (14), (15), (16) and (17), 264.111 through 118, 264.178, 264.197, and 264.280. This section identifies all steps that will be necessary to completely close the Exxon Billings hazardous waste facilities at the end of the operating life. This section also describes the post closure activities required at the land treatment unit.

Exxon will maintain on-site copies of the approved closure and post closure plans and all revisions to the plans until a certification of closure completion has been submitted and accepted by the EPA, Region VIII. Exxon will notify the Regional Administrator of the EPA at least 180 days prior to the expected date of closure. Operations of the hazardous waste management facilities is expected to continue for the life of the refinery, which is assumed to be 30 years; therefore, closure would begin in the year 2013. Upon completion of closure, Exxon will submit to the Regional Administrator of EPA a certification by both Exxon and an independent, registered professional engineer that the facility has been closed in accordance with the specifications of the approved closure plan.

11.1 CLOSURE PLAN

The closure plan was designed to (1) insure that only the land treatment area will require post closure care, maintenance, and controls, (2) minimize the need for further maintenance, and (3) controls or minimizes the post closure escape of hazardous waste, hazardous waste constituents, or waste decomposition products to the environment. At closure, potentially contaminated soil will be tested to verify the removal of all waste. Contaminated soil, except in the land treatment areas, will be excavated, removed, and disposed of at a proper disposal facility.

All hazardous waste facility sites will be graded to prevent post closure erosion. The following subsections discuss in detail efforts to be made by Exxon to satisfy the closure performance standard. General descriptions of the hazardous waste facilities are found in Section 3.0 and specific information for each facility is found in Section 13.0 of this application.

11.1.1 Partial and Final Closure Activities

Exxon plans do not contemplate closure of any of its on-site hazardous waste facilities prior to the closure of the refinery, now estimated to occur in the year 2013. Substantive modifications to the facilities, equipment, structures, or procedures will result in the updating of the closure and post closure plan.

The on-site hazardous waste operations consist of the Waste Staging Area, Lead Weathering Tank, and the Land Treatment Unit.

11.1.2 Maximum Extent of Operation

Waste Staging Area

The Waste Staging Area is a 1.5 acre parcel of land that is used to accumulate hazardous wastes in containers and prepare them for off-site disposal. All hazardous waste in containers is stored on the 100'x 100' concrete, palletized container storage pad. A total of 250 drums could be stored on this pad. Hazardous wastes will be stored on this pad throughout the life of the refinery. There is no other waste container storage area at the refinery.

Lead Weathering Tank

The Lead Weathering Tank is a 100' x 100' x 3' open topped, steel tank having a volume of 225,000 gallons that is used to weather leaded tank wastes. This tank will be used to treat leaded tank wastes for the life of the refinery.

Land Treatment Area

The Land Treatment Area is divided into two parts: the South Land Treatment Area (15 acres) and the East Land Treatment Area (20 acres). The total Land Treatment Area is approximately 35 acres. The East Land Treatment Area can be sub-divided into 3 parts: the Old East (5 acres), New East Seeped (8 acres), and New East non-seeped (7 acres). The Old East and New East Seeped areas are not used due to the uncertainty of subsurface contamination and near surface groundwater respectively. The South (15 acres) and New East non seeped (7 acres) will be utilized for the life of the refinery on a rotating basis. The Old East and New East Seeped will not be used until the integrity of hazardous waste containment is assured.

11.1.3 Maximum Inventory

The estimated maximum inventory of hazardous waste in storage or treatment was determined as follows:

Waste Staging Area - Maximum design numbers of drummed hazardous waste

Lead Weathering Tank - Thirty years total annualized weight of wastes applied less 70% of the oil fraction due to degradation and less 99% of the moisture content due to evaporation/infiltration

The maximum inventories are then as follows:

EPA Process Code	Facility Designation	Maximum Inventory
S01	Waste Staging Area - Palletized Drum Storage Pad	250-55 gallon drums or 13,750 gallons
T66	Lead Weathering Tank	60 yd.^{3} of weathered sludge
D81	Land Treatment Units	43,600 yd.^{3} of land treatment operations residue

It is not contemplated that any soil will be contaminated at the hazardous waste storage or tank treatment areas. Facilities, except for the land treatment area, are located on concrete or asphalt covered areas.

11.1.4 Decontamination of Equipment and Structures

Waste Staging Area

Equipment utilized at the palletized drum storage pad and the drum crushing pad will be decontaminated as necessary after the inventory of wastes has been removed. This will be accomplished as follows:

1. Pads will be thoroughly decontaminated by water/steam cleaning.
2. Fork lift, drum crusher and miscellaneous tools thoroughly decontaminated by water wash/steam cleaning. Effectiveness of decontamination is determined through visual inspection.
3. Re-clean as necessary to ensure visual decontamination of all oils and tars.
4. Condensed sump water is tested for corrosivity and EP toxicity to determine whether disposal as a hazardous waste is required. If non-hazardous the condensed water will be placed in the refinery sewer via vacuum truck. If hazardous, the condensed water will be disposed at a proper disposal facility.
5. Sumps are completely decontaminated by steam cleaning.
6. Condensed sump water is tested for corrosivity and EP toxicity to determine whether disposal as a hazardous waste is required. If non-hazardous the condensed water will be placed in the refinery sewer via vacuum truck. If hazardous, the condensed water will be disposed at a proper disposal facility.

7. Based on the nature of the wastes (identified in Part A) and following steam cleaning and condensate removal, all hazardous wastes will have been removed or will be in such low concentrations that only testing for EP toxicity of a chunk of sump material will be performed.

Shipment of all containerized hazardous waste meets all Department of Transportation (DOT) regulations. Palletized banded barrels are loaded via a fork lift truck onto the transport vehicle which also complies with all DOT regulations.

Lead Weathering Tank

After the weathered lead residue has been removed for off-site disposal, the tanks and miscellaneous tools will be decontaminated as follows:

1. Water wash all walls and use steel and fiber brooms to push residue to one corner.
2. Allow water to evaporate.
3. With steel and fiber broom, sweep tank bottom residue to one corner.
4. Remove all solids to barrels.
5. Dismantle and dispose of broom, shovels, gloves, etc., into barrels.
6. Remove barrels to WSA for disposal at off-site disposal facility.
7. Water wash tank walls and floors.
8. Test wash water for corrosivity and EP toxicity to determine whether disposal as a hazardous waste is required. If non-hazardous the wash water will be placed in the refinery sewer. If hazardous, the wash water will be disposed of at a proper disposal facility.

Land Treatment Area

Decontamination will be as follows:

1. Apply last waste on the land treatment area.
2. Water wash dump trucks used to remove waste with water onto the land treatment area being cautious not to pool water or water wash at the API Separator area into the separator.
3. Water wash vacuum truck as in 2.
4. Disk in remaining waste and the entire land treatment area.
5. No hand tools are used in closing the land treatment area.
6. Following disking (about 1 year later), the tilling equipment is to be water washed near the refinery sewer (API Separator) to collect all wash water in the sewer system.
7. If refinery sewers are closed, water washing is to take place on the land treatment unit as in 2 above.
8. Decontamination is complete when no waste or dirt remain on the equipment.

11.1.5 Closure and Post Closure of the Waste Staging Area

The following procedure will be used to close the Waste Staging Area:

A. Cease operation, allow no more wastes to be received.

B. Crush all empty drums.

C. Prepare all wastes for off-site shipment.

D. Ship wastes to Chem-Security or other secure Class 1 waste disposal site.

E. Decontaminate equipment and structures.

F. Dispose of decontamination liquids.

G. Remove drum crusher and safety building.

H. Remove concrete pads, asphalt, and liner and dispose in appropriate manner.

I. Note: Take a sample chunk of sump and test for EP toxicity to confirm pads to be non-hazardous.

J. Obtain soil coring under sump and conduct EP toxicity to verify no soil contamination has occurred.

K. If present, contaminated soil will be excavated, removed and disposed of at a proper disposal facility.

Based on the nature of the hazardous wastes found in this area, the materials of construction used to build the facility plus the method and experience used to decontaminate the facility, no hazardous wastes are expected to remain. However, EP toxicity testing of a chunk of sump and underlying soil will be performed. Ignitable hazardous wastes are removed by steam cleaning, HF Alky tars are removed by steam cleaning and collected in the water; solvents are removed by steam cleaning and leaded sludge is sucked up with the removed water. Due to the inspections and in-use care maintained, sufficient protection preventing ground/groundwater contamination is in place. Equipment required for the closure of the Waste Staging Area would include:

- Waste transportation vehicle
- Fork Lift
- Miscellaneous tools
- Dozer or grader

No post closure care of the Waste Staging Area is required because all hazardous wastes and hazardous waste residue will be removed from the facility.

11.1.6 Closure and Post Closure of the Lead Weathering Tank

The following procedure will be used to close the Lead Weathering Tank:

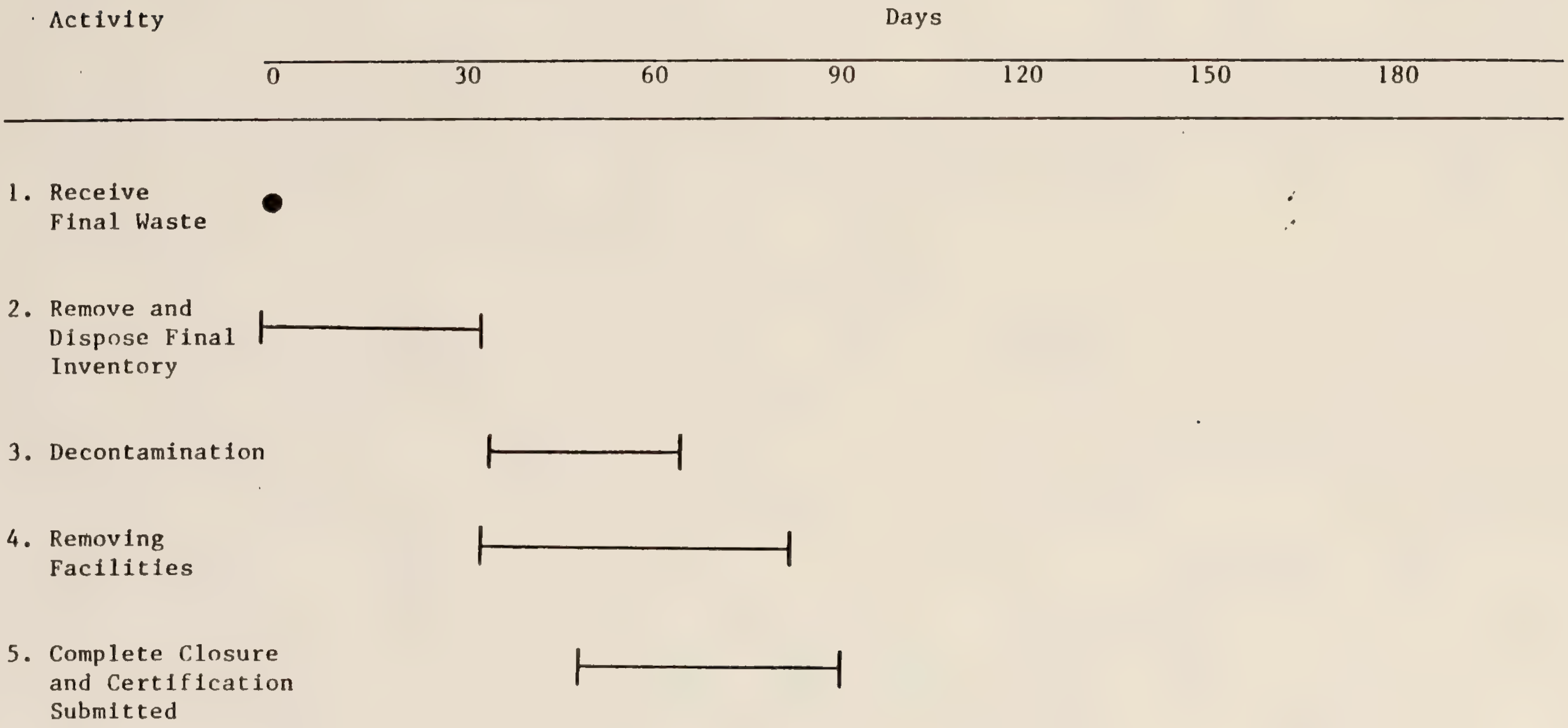
A. Cease receiving waste.
B. Allow water to evaporate from last waste.
C. Remove waste residue from tank and ship to off-site disposal.
D. Wash tank.
E. Evaporate wash water.
F. Wash tank and remove wash water.
G. Dismantle tank.
H. Submit a section of tank shell or floor for laboratory testing EP Toxic lead using the EP Toxicity test methods in 40 CFR 261, Appendix II. If less than 5.0 ppm EP Toxic lead, tank is non-hazardous and may be disposed of as non-hazardous.
I. Obtain composite soil sample of material between tank bottom and liner using a 20' x 20' grid (25 samples) conduct EP toxicity analysis 40 CFR 261. If less than 5.0 ppm EP toxic lead no ground contamination has occurred.
J. Dismantle liner system and dispose as non-hazardous.
K. Regrade and revegetate.
L. Note: If lead contamination is found contaminated soil will be removed and disposed of at proper disposal facility.

Equipment required for closure of the Lead Weathering Tank would include:

- Miscellaneous tools
- Vacuum truck
- Waste transportation vehicle
- Welder
- Crane and truck
- Dozer or grader

Figure 11-1.

SCHEDULE FOR CLOSURE -
WASTE STAGING AREA AND HF NEUTRALIZATION TANKS



MODULE VI

SPECIAL CONDITIONS

TREATMENT ZONE SEPARATION DEMONSTRATION

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MODULE VI - SPECIAL CONDITIONS

TREATMENT ZONE SEPARATION DEMONSTRATIONS

A. APPLICABILITY

1. 40 CFR 264.271(c), incorporated by reference in ARM 16.44.702, states that a land treatment facility permit must specify the vertical dimensions of the treatment zone. Further, the treatment zone is defined as the soil below and including the land surface, where hazardous constituents are degraded or immobilized. It is specified that the treatment zone shall not be deeper than 1.5 meters (5 feet), and that there shall be at least 1 meter (3 feet) of separation between the bottom of the treatment zone and the seasonal high water table in the area underlying the land treatment unit.

   The Department has expressed concern that there are locations within the Old and New East Land Treatment Units where:

   a. hazardous constituents have migrated below 1.5 meters (5 feet); or

   b. the water table has risen to within less than 1 meter of the bottom of the treatment zone; or

   c. there have been both migration of hazardous constituents below the treatment zone, and inadequate separation between the treatment zone and the water table.

2. The Permittee believes that although there are specific locations within the Old and New East Land Treatment Units that do not meet the requirements of 40 CFR 264.271(c), certain sectors are suitable. The Permittee intends to demonstrate through soil corings and installation of piezometers, which sectors are suitable for continued land

treatment. The Permittee shall also determine which locations are unsuitable and what actions will be taken to correct contamination problems, as required under Condition 0.2.a. of Module IIIa.

B. EVALUATION AND NOTIFICATION

1. The New East and Old East Land Treatment Units, or any sectors of those units, are only to be included in the Permit if the demonstration outlined in Condition C. of this Module is submitted to the Department by October 7, 1988, and deemed satisfactory. The Department will make the final decision as to the completeness and adequacy of the demonstration.

2. The Department shall notify the Permittee by registered mail by October 21, 1988, as to its decision in accepting the demonstration and including any of the New and Old East Land Treatment Unit sectors in the permitted areas.

3. By November 10, 1988, the Department will issue the necessary revised permit pages, based on its decision to include any sectors of the East Land Treatment Units in the permitted areas. The revised pages and a fact sheet on the Department's decision will be made available to the Permittee.

4. The Department will inform all members of the general public who expressed interest in the Permit during the public comment period of its decision by mailing out the fact sheet and making the revised permit pages available for public review. A legal notice or press release may also be issued.

C. DEMONSTRATION

1. Treatment Zone Demonstration

The Permittee must demonstrate through a series of borings and soil sampling, with analysis for PHCs listed in Attachment IIIa5, that there are no hazardous constituents in the soil immediately below the depth determined to be the treatment zone. Such a demonstration must be made for each sector to be considered for permitting. Refer to Attachment VI1, for the general plan to be followed for this demonstration.

2. Depth to Water Table

The Permittee must demonstrate, through installation of piezometers into the fine-grained formation overlying the gravel formation at the East Land Treatment Units, that the seasonal high water table has not infiltrated the 1 meter (3 foot) buffer zone below the treatment zone. Such a demonstration must be made for each sector to be considered for permitting. The demonstration is to be made between August 1, 1988, and October 1, 1988.

The 1988 season has been abnormally dry and the Permittee has been unable to monitor the water table for the entire period of the 1988 irrigation season. For this reason, water level demonstration specified in Condition C.2. of this Module shall extend through the 1989 high water table season. The Department reserves the right to require water level monitoring in subsequent years.

Refer to Attachment VI2, for the general plan to be followed for this demonstration.

MODULE IV

GROUNDWATER MONITORING

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MODULE IV STANDARD CONDITIONS

A. APPLICABILITY

1. The requirements of this module shall pertain to the following regulated units identified in Condition II.A.:

   a. South Land Treatment Unit

   b. Any sector in the New East and Old East Land Treatment Units meeting the conditions outlined in Module VI of this Permit:

2. Permit modification provisions under Condition IV.E.5. shall be followed in defining the specific well placement and other requirements to be followed for groundwater monitoring.

3. The Department shall also determine whether other solid waste management units may need to be subject to certain or all of the provisions of this Module. The Permittee must comply with the provisions of 40 CFR 264 Subpart F as incorporated by reference in ARM 16.44.702 regarding corrective action.

4. The Permittee must follow all of the provisions under ARM 16.44.702, and the following rules regarding groundwater protection in the Montana Clean Water Act: ARM 16.20.601-643, ARM 16.20.701-705 and ARM 16,20.1001-1025 and as defined by these permit conditions.

5. For purposes of this permit, the ARM 16.44.702 regulations and the following rules regarding groundwater protection in the Montana Clean Water Act: ARM 16.20.601-643, ARM 16.20.701-705 and 16,20.1001-1025 shall apply to all units at the facility defined above. However, provisions for detection and compliance monitoring shall be defined specifically for unit

waste management compliance points under 40 CFR 264, Subpart F as incorporated by reference in ARM 16.44.702 except as determined by the Department. The present waste management areas and compliance points defined below are shown in Figures 12.10, 12.11, 12.13, and 15.10 in the Application.

a. The surface location of the South Land Treatment Unit is defined in Condition II.A. of the Permit and shown in Figure 12.9 of the Application (Attachment IV.1.). The points of compliance are a line encircling this unit at the toe of the outer berm. Wells # N-9R, N-9AR, ERM-6R and N-7A and N-7AX as described in Section 15.3.1 of the Application (Attachment IV.3.) shall serve as monitoring wells for the South Land Treatment Unit.

b. The surface location of the New East and Old East Land Treatment units is defined in Condition II.A. of this Permit and shown in Figures 12.10 and 12.11 of the Application (Attachment IV.2). These two units fall within a single monitoring system. The points of compliance are a line encircling the New East and Old East Land Treatment Units at the toe of the outer bermed area. Wells # ERM-1, W-15, N-16B, W-17 and N-17A as described in Section 15.3.1 in the Application (Attachment IV.3.), shall serve as monitoring wells for the South Land Treatment Unit. If, under the conditions of Module VI of this Permit, the operating conditions are redefined for either the Old East or the New East Land Treatment Units, the Permittee shall submit appropriate groundwater monitoring plans to the Department for approval under the conditions of this Permit. Any sector in the East Land Treatment Unit that fails to meet conditions in Module VI by October 7, 1988, must cease receiving waste before November 8, 1988, and begin closure activities as specified in Condition III.a.o.

c. Addition of new units subject to this section shall follow the same general procedure for defining waste management areas, or as otherwise determined by the Department.

6. Regulated units subject to these provisions may only be excluded based on the criteria set forth in 40 CFR 264.90(b) as incorporated by reference in ARM 16.44.702. The regulations and conditions of this permit for groundwater monitoring apply during the active life of the regulated unit including the closure period, and as defined in 40 CFR 264 Subparts F, G and M as incorporated by reference in ARM 16.44.702 during compliance and post-closure periods.

B. REQUIRED PROGRAMS

1. The Permittee shall conduct a monitoring and response program as follows for all units subject to these provisions:

   a. Whenever one or more hazardous constituents under 40 CFR 264.93 as incorporated by reference in ARM 16.44.702 from a regulated unit are detected at the compliance point(s) under the conditions of this Permit, the Permittee shall institute a compliance monitoring program as defined in this Permit and 40 CFR 264.99 as incorporated by reference in ARM 16.44.702.

   b. Whenever the groundwater protection standard under 40 CFR 264.92 as incorporated by reference in ARM 16.44.702 and Condition IV.C. of this permit is exceeded, the Permittee shall institute a corrective action program under 40 CFR 264.100 as incorporated by reference in ARM 16.44.702 and Condition IV.G. of this permit.

   c. Whenever hazardous constituents under 40 CFR 264.93 as incorporated by reference in ARM 16.44.702 exceed

concentration limits under Condition IV.C. of this permit in groundwater between the compliance point defined in Condition IV.A.5. of this Permit and the facility property boundary, the Permittee shall institute a corrective action program under 40 CFR 264.100 as incorporated by reference in ARM 16.44.702 and Condition IV.G. of this permit; or

d. In all other cases, the Permittee shall institute and maintain a detection monitoring program under 40 CFR 264.98 as incorporated by reference in ARM 16.44.702 and Condition IV.E. of this permit.

2. The Permittee shall follow all of the elements of these required programs as defined in this section of the permit. The Department may include one or more of the programs in paragraph 1 above as may be necessary to protect human health and the environment and will specify the circumstances under which each of the programs may be required.

C. GROUNDWATER PROTECTION STANDARD

The Department shall establish groundwater protection standards for each hazardous constituent that has entered groundwater at the time the detection monitoring program or other evidence indicates that hazardous constituents have entered groundwater beneath a regulated unit. The Department shall also determine at such time the hazardous constituents to which the protection standard applies as defined in 40 CFR 264.93 as incorporated by reference in ARM 16.44.702 , the concentration limits as defined in 40 CFR 264.94 as incorporated by reference in ARM 16.44.702, the point(s) of compliance under 40 CFR 264.95 as incorporated by reference in ARM 16.44.702, and the compliance period under 40 CFR 264.96 as incorporated by reference in ARM 16.44.702. At the time of permit issuance, the Department has determined that monitoring evidence does not indicate groundwater contamination and that maintenance

of a detection monitoring system is appropriate.

D. GENERAL GROUNDWATER MONITORING REQUIREMENTS

1. General

The Permittee shall comply with the following general requirements for groundwater monitoring:

a. The groundwater monitoring system shall consist of a sufficient number of wells, installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that:

i. represent the quality of background water that has not been affected by leakage from a regulated unit; and

ii. represent the quality of groundwater passing the point of compliance.

b. Separate groundwater monitoring systems for existing regulated units as described in Condition IV.A.5 and any new unit(s) shall be required, unless it is impractical to detect and measure hazardous constituents from each unit at the point(s) of compliance entering groundwater in the uppermost aquifer. Under the latter condition, 40 CFR 264.97(b) as incorporated by reference in ARM 16.44.702 shall apply.

c. A minimum of three down gradient wells and one upgradient well shall be installed for each new landfill cell or other new unit subject to these provisions during the term of the permit. The Permittee shall maintain monitoring wells as specified in Condition IV.A.5.

d. All monitoring wells shall be constructed in accordance with the provisions in 40 CFR 264.97(c) as incorporated

by reference in ARM 16.44.702 and Condition IV.D.2. of this permit.

e. The groundwater monitoring program shall include consistent sampling and analysis procedures defined in 40 CFR 264.97(d) as incorporated by reference in ARM 16.44.702 and Section 15.3.2 of the Application (Attachment IV.4).

f. The Permittee shall follow requirements for measurement of the groundwater surface elevation as specified in Condition IV.D.4. of the Permit and Section 15.3.4 of the Application (Attachment IV.5).

g. The Permittee shall follow the requirements for establishing background water quality for specified hazardous constituents and monitoring parameters as defined in Condition IV.D.5. of the Permit.

h. The Permittee shall follow the procedures for statistical evaluation in determining whether background values of concentration limits have been exceeded as defined in Condition IV.D.6. of the Permit.

2. Well Location and Construction

a. Well construction shall generally follow the techniques described in Attachment IV. 7. All monitoring wells shall be cased in a manner that maintains the integrity of the monitoring well bore hole. This casing shall be screened or perforated and packed with gravel or sand where necessary (i.e., the space between the bore hole and well casing) above the sampling depth shall be sealed to prevent contamination of samples and the groundwater.

b. The Permittee shall construct and maintain new monitoring wells in accordance with plans and specifications to be submitted to the Department for approval at the time of permit modification under Condition IV.E.5. of this Permit or to satisfy conditions under Module VI of this Permit. The Department will pre-approve in writing numbers and locations of all new wells prior to installation.

c. Additional saturated zone monitoring wells shall be installed to maintain compliance if subsurface conditions significantly change after permit issuance. Such changes may include but are not limited to, water level elevation or apparent flow direction changes, or detection of organic constituents in a well. The Department may require the Permittee to install and sample additional wells at any time during active life, closure, or post-closure or compliance periods if new information or unforeseen circumstances reveal a need for additional monitoring to protect human health and the environment.

d. The Permittee shall submit monitoring well completion reports which include boring logs, analytical tests performed on soils (Atterberg limits, etc.), water level elevations, water contour maps, well development results including recharge rates, as well as all other data, to be obtained within 90 days after completion of wells installed after permit issuance.

e. Existing monitoring wells shall be maintained in a fully operating condition for the duration of this permit, except as identified below. The Permittee shall notify the Department when a well is no longer properly functioning (including a marked change in pumping rate, presence of sandy or silty materials, and cracked or

broken casings) or when the Permittee intends to close one or more wells associated with a regulated or solid waste management unit. The Department shall specify the conditions for replacement or correction of improperly operating well(s).

3. Sampling and Analysis Procedures

a. The Permittee must include and maintain consistent sampling and analysis procedures in the groundwater monitoring program that are designed to ensure reliable monitoring results of groundwater quality below a waste management area. At a minimum, the program shall include procedures and techniques for:

i. sample collection;
ii. sample preservation and shipment;
iii. analytical procedures; and
iv. chain-of-custody control.

b. The sampling and analytical methods must be appropriate for groundwater sampling and accurately measure hazardous constituents in groundwater samples.

c. The Permittee shall use the following techniques and procedures when obtaining samples and analyzing samples from the groundwater monitoring wells:

i. Samples shall be collected by the technique described in Section 15.3.2 of the Application (Attachment IV.4.).

ii. Samples shall be preserved and transported in accordance with the procedures specified in SW846, Test Methods for Evaluating Solid Wastes, Physical Chemical Methods, (SW846) Third Edition.

iii. Samples shall be analyzed according to the methods and/or procedures specified in SW846 for the Principal Hazardous Constituents as defined in Condition D.5.a. of this Module.

d. The Department may request at any time all lab QA/QC documentation and supporting data on any sampling episode. The Permittee shall retain either at the laboratory or at the facility, the raw organics information for required sampling and analysis, including organics gas chromatographic printouts, mass spectral analyses, QA/QC surrogate and spiking results, etc. These data shall be retained for a period of not less than three years.

e. Samples shall be tracked and controlled using the chain-of-custody forms in Attachment III.a.21. of this Permit.

4. Groundwater Elevation

a. The Permittee shall determine the groundwater surface elevation using the methods and procedures outlined in Attachment IV.5. in all monitoring wells on a semi-annual basis, unless otherwise instructed by the Department or Module VI of this Permit.

b. The Permittee shall determine the groundwater flow rate and direction in the uppermost aquifer using procedures and methods described in section 15.4.6 of the Application (Attachment IV.6) and submit an updated groundwater contour map to the Department in the first quarter of each year.

5. Background Water Quality and Monitoring Parameters

a. Monitoring Parameters

For purposes of the detection monitoring program as specified in Condition E. of this Module, there shall be three classes of parameters for measurement and analysis:

i. Principal Hazardous Constituents (PHCs)

The first class consists of a set of organic hazardous constituents measurable by gas chromatography/mass spectrometry (GC/MS), and two hazardous metals. These are listed in Attachment IV. 8. These compounds have been selected from the modified Skinner List for refinery constituents. The PHCs are found in significant quantities in the permitted wastes, and provide a reliable indication of the presence of hazardous constituents in the groundwater.

ii. The Modified Skinner List

The Skinner List is a subset of "Appendix IX" compounds found in refinery waste streams. These are listed in Attachment III.a.10.

iii. Background Water Quality Parameters

This third class of parameters provides additional information regarding evidence of possible groundwater contamination. These are listed in Attachment IV.9.

iv. The PHC detection monitoring parameters shall be subjected to statistical evaluation as defined in Condition E.1. of this Module. The second class of Skinner List parameters must be sampled under Condition IV.E.1.h. of this Permit, when the detection monitoring program indicates a

statistically significant occurrence in detection monitoring. The third set of parameters shall be measured at each required detection monitoring event to provide a basis for comparison in the event modifications are required in the monitoring network, or unusual changes are noted in groundwater quality. The latter shall be evaluated as described in Condition E.2. of this Module.

b. Definitions

i. A reportable value is defined as any measured concentration for an analyte in Attachments IV. 8 and IIIa.3 which equals or exceeds the listed practical quantification limit (pql) or the method detection limit as determined by the analytical laboratory, provided that the method detection limit does not exceed the pql. The Department may modify the latter requirement upon evaluation of laboratory information indicating the pql cannot be achieved.

ii. The practical quantification unit (pql) is defined in SW-846. These pql's are EPA's current best estimate of the practical sensitivity of the applicable method for RCRA groundwater monitoring purposes. Attachment IV.10. contains a discussion and listing of 40 CFR Part 264, Appendix IX (Appendix IX) pql's.

iii. A critical value for a given compound is any measured concentration which equals or exceeds the .01 level of significance as listed in Attachment IV.8.

c. Background Water Quality

i. Attachment IV.8 and IV.10 lists a set of numerical

standards for each hazardous constituent considered to be the concentration equal to or above which a given parameter value exceeds the .01 level of confidence. Since all current monitoring wells have shown no evidence of groundwater contamination, all of the organics included in the PHC and Skinner List detection parameters have critical .01 concentrations equal to the practical quantitation limit (pql).

ii. The permit conditions assume that for all detection monitoring and Appendix IX parameters which have historically not been measured by the Permittee at the facility, the critical and reportable values are equal to the pql.

iii. The Permittee may petition to the Department to modify the background data, based on future detection monitoring results obtained during the term of this permit.

6. Other Conditions

a. The Permittee shall monitor all wells covered by this permit semi-annually at a minimum in the detection monitoring program, and as otherwise specified below.

b. All newly constructed monitoring wells shall require one year of quarterly sampling for all background parameters listed in Attachment IV.9. Detection monitoring for PHC's listed in Attachment IV.8. shall begin the next semi-annual period following installation of the well(s). The Permittee shall conduct at least one evaluation of PHC parameters immediately following completion of the well(s). If hazardous organic constituents are detected above the critical levels, the Permittee shall also

conduct quarterly sampling at those wells for a one-year period. The Department may determine that the well(s) can be used at any time in this period for detection monitoring.

c. The Department may modify parameters or methods of analysis, including statistical analysis, for any samples upon written notice to the Permittee, if necessary. Conditions requiring modification may include maintaining or upgrading the quality of type of data produced by the Permittee to account for background conditions, future conditions such as availability of improved analytical methods, the presence of better indicators, or more easily detectable parameters in leachate. The Department will also prescribe in writing additional sampling and analysis for wastes contained in a unit or leachate deemed appropriate to determine whether a hazardous constituent may have originated from a unit, to establish appropriate monitoring parameters, or for other reasons.

E. DETECTION MONITORING PROGRAM AND DATA EVALUATION

1. Principal Hazardous Constituents

The detection monitoring program for PHC's listed in Attachment IV. 8., shall in general follow the protocol specified by the following conditions:

a. The Permittee shall analyze for PHC's listed in Attachment IV.8. semi-annually for all monitoring wells covered in this permit, unless the wells for a given waste management area are covered under compliance monitoring in Condition F of this permit. At least one set of replicates, one field blank, one trip blank, and three laboratory blanks for the period spanning the time of analysis shall be reported.

b. The Permittee shall provide the Department within 30 days of analysis a list of compounds analyzed, reportable values for each compound found in a well sample, detection limits or reporting limit (e.g. pql) for each compound, a determination whether any reportable values have exceeded critical values in Attachment IV.8, and any additional analyses deemed appropriate by the Permittee to explain exceedances of the critical values.

c. The Permittee shall also organize the reportable PHC information in a form which readily allows for evaluation under this section. All reportable values shall be shown for each well and for each of the last three analyses (including repeat analyses). Wells shall be grouped as background and for each of the waste management area well sets defined in Condition A.5. of this module.

d. The Permittee shall determine whether a given compound concentration value has equalled or exceeded the critical value by simple comparison with the table values in Attachment IV.8.

e. For any well where one or more hazardous constituent are found at or above critical levels, the well shall be re-sampled within 30 days of the permittee receiving the information and notifying the Department, unless the Department has determined that a re-sampling is unnecessary. The Permittee may choose to re-sample immediately upon receipt of initial data results, where exceedances of the critical levels are indicated. This re-sample data shall be provided to the Department with the initial data. Re-sampling need only take place for those compounds and at those wells where exceedances of the critical levels are indicated.

f. Once the monitoring data has been submitted to the Department, the Permittee may continue to develop evidence which could indicate a source of contamination other than a regulated unit. If repeat sampling indicates exceedances of the critical level for at least one hazardous compound in a well, the data shall be considered a statistically significant indication of well contamination,

g. If the Permittee determines, pursuant to Condition E.1. e. and f. of this Module that there is a statistically significant increase in any PHC parameter, he shall notify the Department in writing within seven days. The notification shall indicate which parameters and wells have shown statistically significant increases.

h. For the well or wells which show a statistically significant indication of well contamination as defined in Condition E.1.f. of this Module, the Permittee shall immediately sample that well or wells for the modified Skinner List constituents in III.a.6. and provide results to the Department within 30 days.

i. If Skinner list analysis indicates a third instance of concentrations of hazardous constituents above the detection limit, the permittee shall submit to the Department an application for a permit modification and plan to establish a compliance monitoring program for the waste management area(s) showing statistically significant increases, to meet the requirements of 40 CFR 264.99 as incorporated by reference in ARM 16.44.702. The application and plan shall include the following information:

i. an identification of the concentration of any Skinner List constituents (Attachment III.a.6) found in the groundwater at each monitoring well in a waste management area at the compliance point(s);

ii. any proposed changes to the groundwater monitoring system at the facility necessary to meet the requirements of 40 CFR 264.99 as incorporated by reference in ARM 16.44.702;

iii. any proposed changes to the monitoring frequency, sampling and analysis procedures used at the facility necessary to meet the requirements of 40 CFR 264.99 as incorporated by reference in ARM 16.44.702; and

iv. for each hazardous constituent found at the compliance point, a proposed concentration limit or a notice of intent to seek a variance under 40 CFR 264.94(b) as incorporated by reference in ARM 16.44.702.

j. The Permittee shall submit within 180 days to the Department all data necessary to justify any variance sought under 40 CFR 264.94(b) as incorporated by reference in ARM 16.44.702 and an engineering feasibility plan for a corrective action program necessary to meet the requirements of 40 CFR 264.100 as incorporated by reference in ARM 16.44.702, unless:

i. all hazardous constituents identified under this section are listed in Table 1 of 40 CFR 264.94 as incorporated by reference in ARM 16.44.702, and their concentrations do not exceed the respective values given in that Table, or

ii. the Permittee has sought a variance under 40 CFR 264.94(b) as incorporated by reference in ARM 16.44.702 for each hazardous constituent identified in paragraph (h)(2) of 40 CFR 264.97 as incorporated by reference in ARM 16.44.702.

k. The Permittee may demonstrate that a source other than a regulated unit caused the increase or that the increase resulted from error in sampling, analysis, or evaluation. The Permittee is not relieved of the burden of submitting a plan and permit modification under Condition E.5. of this Module unless the demonstration successfully shows that a source other than a regulated unit caused the increase or that the increase resulted from error in sampling, analysis, or evaluation. In making a demonstration, the Permittee shall:

i. Notify the Department in writing within seven days of determining a statistically significant increase under Condition E.1.(f) of this Module, that the permittee intends to make a demonstration under this paragraph;

ii. Within 90 days, submit a report to the Department which demonstrates that a source other than the regulated unit or solid waste management area caused the increase, or that the increase resulted from error in sampling, analysis or evaluation;

iii. Within 90 days, submit to the Department an application for a permit modification and plan to make any appropriate changes to the detection monitoring program at the facility; and

iv. Continue to monitor in accordance with the detection monitoring program established under this section.

All monitoring wells not within the waste management area of concern shall continue in detection monitoring, unless the Department determines that other waste management area wells shall be included in the compliance point area.

l. If the Permittee determines that the detection monitoring program for the waste management area no longer satisfies the requirements of this section, he shall, within 90 days, submit an application for a permit modification and plan approval to make appropriate changes to the program.

m. The Permittee shall assure that monitoring and corrective action measures necessary to achieve compliance with the groundwater protection standard under 40 CFR 264.92 as incorporated by reference in ARM 16.44.702 and Condition IV.C. of this Permit are taken during the term of permit modification and plan approval.

2. Background Water Quality Parameters

a. The Permittee shall also monitor all background parameters listed in Attachment IV.9. at each semi-annual sampling interval at all wells under this Module.

b. The Permittee shall provide an analysis of each of the background parameters as follows, to be provided with each semi-annual sampling reporting:

i. Data for each parameter shall be assembled in understandable form for all sampling activities, for all wells in the facility monitoring system. The data shall show the detection limit for each sampling period. To the extent possible, these data for each parameter shall be reported on a single page for all

wells, organized by background and waste management areas.

ii. The Permittee shall determine whether there has been a statistically significant increase at each monitoring well at the compliance point for each parameter described in Attachment IV.9. using procedures and methods outlined in Section 15.4.8 and 15.4.9 of the Application or that meet the requirements of 40 CFR 264.97(h) as incorporated by reference in ARM 16.44.702.

iii. The Department shall utilize these data and information in assessing the effect of the regulated unit on groundwater quality as required under the Montana Water Quality Act.

3. Quality Assurance/Quality Control Information

The Permittee shall ensure that all laboratory analyses undertaken as part of the permit contain adequate quality control and quality assurance. The laboratory must be capable of evaluating quality control procedures as specified in SW-846. The laboratory must also have quality control and backup information available for specific analyses, which can be accessed if necessary.

4. Recordkeeping

a. The Permittee shall enter all monitoring, testing and analytical data into the operating record as required by Condition II.L. of this Permit.

b. The Permittee shall provide the Department with groundwater monitoring data in accordance with the Conditions of this Module.

5. Permit Modification

a. If the Permittee or the Department determines that the detection, compliance monitoring, or corrective action program required by this permit no longer satisfies the requirements of the regulations, the Permittee must, within 90 days of this determination, submit an application for a permit modification to make any appropriate changes to the program which will satisfy the regulations and Condition I.C. of the Permit.

b. The Permittee must assure that monitoring and corrective action measures necessary to achieve compliance with the groundwater protection standard under 40 CFR 264.92 as incorporated by reference in ARM 16.44.702 and Condition IV.C. of this Permit are taken during the term of the permit.

F. COMPLIANCE MONITORING REQUIREMENTS

1. The compliance monitoring program and assessment shall begin for wells within a waste management area identified in Condition A.1. of this Module at the time the third successive sample shows positive and significant indications of contamination as described in Condition E.1. of this Module, and shall extend throughout the compliance period as defined in Condition F.3. of this Module. The compliance monitoring program shall consist of quarterly sampling of the following compounds:

   a. Principal Hazardous Constituents listed in Attachment IV.8.

   b. Background Water Quality Parameters listed in Attachment IV.9.

c. Groundwater Protection Constituents listed in Attachment IV.11.

d. Any additional hazardous constituents detected after Appendix IX (listed in Attachment IV.10.) analysis, for all compliance point wells within a waste management area.

2. The Permittee must analyze samples from all monitoring wells at the compliance point for all constituents contained in "Appendix IX" listed in Attachment IV.10. at least annually to determine whether additional hazardous constituents are present in the uppermost aquifer. If the Permittee finds Appendix IX constituents in the groundwater that are not identified in the permit as hazardous constituents, the Permittee must report the concentrations of these additional constituents to the Department within seven days after completion of the analysis.

3. The compliance period is the number of years equal to the active life of the waste management area (including any waste management activity prior to permitting, and the closure period).

   a. The compliance period begins when the Permittee initiates a compliance monitoring program meeting the requirements of this Module.

   b. If the Permittee is engaged in a corrective action program at the end of the compliance period specified in Condition F.3. of this Module, the compliance period is extended until the Permittee can demonstrate that the groundwater protection standard of Condition C of this Module has not been exceeded for a period of three consecutive years.

4. The Department may modify, change, add, or delete any specific parameters, in order to meet the criteria of 40 CFR 264 as incorporated by reference in ARM 16.44.702.

5. An analyses for volatile hazardous constituents shall be conducted around each contaminated well or waste management area, if determined by the Department. The Department may also require monitoring of hazardous constituents in wastes, leachate or suspected source of contamination, to determine whether contaminants entering groundwater are reasonably expected to derive from the unit in question.

6. The Permittee shall submit to the Department either a corrective action feasibility plan or variance application with complete supporting data for each hazardous constituent found in groundwater, within 180 days after the initiation of the compliance monitoring program.

7. The Department may require any additional field tests, monitoring well installation, or further analytical tests necessary to adequately assess the horizontal and vertical rate and extent of migration of the contaminants, including the unsaturated zone routes of migration.

8. If any regulated unit within the waste management areas defined in Condition I.B. of this Permit is determined to be the source of hazardous constituents in groundwater, it shall be closed, repaired or otherwise managed in accordance with any relevant specific conditions of this permit for a unit requiring actions in the event of groundwater contamination.

9. The Permittee shall apply for a permit modification to comply with 40 CFR 264.99(i) as incorporated by reference in ARM 16.44.702 and with Condition IV.E.5. of this Permit.

10. The Permittee shall submit to the Department within 90 days from initiation of the compliance monitoring program, an interim information report of groundwater analysis and all other information collected or proposed to be collected to identify the source of contaminants and extent of release in groundwater, and any proposed alternate concentration limits.

    a. The Department may accept, reject, or modify any part of the proposed information collection procedures, based on the technical adequacy of the proposals, in complying with the requirements of 40 CFR 264.99(i)(2) as incorporated by reference in ARM 16.44.702.

    b. The Permittee must ensure that monitoring and corrective action measures necessary to achieve compliance with the groundwater protection standard are taken during the compliance monitoring period.

11. The method of statistical comparison to determine compliance with the groundwater protection standard shall follow the procedures in Condition IV.E., of this permit. Hazardous metal parameters shall be compared with arithmetic background means and standard deviations, using a suitable outlier testing method for comparison of single values against a background distribution. The statistical procedure shall be appropriate for the distribution of the data used to establish background values and shall provide a reasonable balance between the probability of falsely identifying a significant difference and the probability of failing to identify a significant difference.

12. The Permittee shall comply with 40 CFR 264.97(g) as incorporated by reference in ARM 16.44.702 in developing a data base for determining background values for any new units and expressing background values in a form necessary for the

determination of statistically significant increases under 40 CFR 264.97(g) as incorporated by reference in ARM 16.44.702. The Permittee shall use a groundwater monitoring system as set forth in 40 CFR 264.97(a)(1), (b) and (c) as incorporated by reference in ARM 16.44.702, and according to the terms of this permit.

13. The Permittee shall determine the groundwater surface elevation in all monitoring wells each time a well is sampled, unless otherwise instructed by the Department.

14. The Permittee shall continue to determine the groundwater flow rate and direction in the uppermost aquifer for compliance monitoring wells in addition to those wells still in detection monitoring. The Permittee shall also continue to submit an updated groundwater contour map to the Department in the first quarter of each calendar year.

15. The Department will establish the groundwater protection standard under Condition IV.C. of this Permit, such that if a "Groundwater Protection Constituent" listed in Attachment IV.11 is identified and the difference between the respective concentration limit listed in Attachment IV.11. and the background value of that constituent is not statistically significant, the background value of the constituent will be used as the concentration limit.

16. The Permittee shall use procedures and methods for sampling and analysis that meet the requirements of 40 CFR 264.97(d) and (c) as incorporated by reference in ARM 16.44.702, and Attachment IV.4., Attachment IV.5. and SW846.

17. The Permittee shall determine whether there is a statistically significant increase over concentration limits established for each hazardous constituent under the groundwater protection

standard, each time the concentration of hazardous constituent(s) is determined at the compliance point(s).

18. If the Permittee determines that the groundwater protection standard is being exceeded at any monitoring well within the point(s) of compliance, he shall:

    a. notify the Department of this finding in writing within seven days. The notification shall indicate which concentration limits have been exceeded;

    b. submit to the Department an application for a plan approval and permit modification to establish a corrective action program meeting the requirements of 40 CFR 264.100 as incorporated by reference in ARM 16.44.702 within 180 days, or within 90 days if an engineering feasibility study has been previously submitted to the Department under 40 CFR 264.98(h)(5) as incorporated by reference in ARM 16.44.702 and Condition E.1.l. of this module. The application shall include, at a minimum, a detailed description of corrective actions that will achieve compliance with the groundwater protection standard specified in the plan approval, and a plan for a groundwater monitoring program that will demonstrate the effectiveness of corrective action.

19. The Permittee may demonstrate that a source other than a regulated unit under these permit requirements caused the increase beyond the groundwater protection standard, including increases resulting from sampling, analytical or evaluation error. While the Permittee may make a demonstration in addition to, or in lieu of, submitting a plan approval modification application under Condition E.5. of this Module, he is not relieved of the requirement to submit a plan approval modification application within the

time specified, unless the demonstration made under this paragraph successfully shows that a source other than the regulated or solid waste management unit in question caused the increase.

In making a demonstration under this paragraph, the Permittee shall:

a. notify the Department in writing in seven days that he or she intends to make a demonstration under this paragraph;

b. within 90 days, submit a report to the Department which demonstrates that a source other than a regulated unit under these provisions caused the standard to be exceeded;

c. within 90 days, submit to the Department an application for a plan approval modification and permit modification to make any appropriate changes to the compliance monitoring program at the facility; and

d. continue to monitor in accordance with the compliance monitoring program established under this section, for the waste management area in question.

20. If the Permittee determines that the compliance monitoring program no longer satisfies the requirements of this section, he shall, within 90 days, submit an application for a plan approval and permit modification to make any appropriate changes to the program.

G. CORRECTIVE ACTION REQUIREMENTS

1. If the Permittee is required to establish a corrective action program under this section, he shall:

a. Take corrective action to ensure that regulated units

under these requirements are in compliance with the groundwater protection standard under 40 CFR 264.92 as incorporated by reference in ARM 16.44.702 and Condition IV.C. of this Permit. The Department will specify the groundwater protection standard requirements in the facility plan approval and permit modification including:

i. a list of hazardous constituents identified under 40 CFR 264.93 as incorporated by reference in ARM 16.44.702;

ii. concentration limits under 40 CFR 264.94 as incorporated by reference in ARM 16.44.702 for each of those hazardous constituents;

iii. the compliance point(s) under 40 CFR 264.95 as incorporated by reference in ARM 16.44.702; and

iv. the compliance period under 40 CFR 264.96 as incorporated by reference in ARM 16.44.702.

2. The Permittee shall implement a corrective action program that prevents hazardous constituents from exceeding their respective concentration limits at the compliance point(s) by removing the hazardous constituents or treating them in place. The plan approval will list the specific measures which shall be taken.

3. The Permittee shall begin corrective action within a reasonable time period after the groundwater standard has been reported to have been exceeded. The Department will specify the time period in the facility plan approval. If a facility plan includes a corrective action program in addition to a compliance monitoring program, the plan approval shall specify when the corrective action will begin

and such a requirement shall operate in lieu of 40 CFR 264.99(i)(2) as incorporated by reference in ARM 16.44.702.

4. In conjunction with a corrective action program, the Permittee shall establish and implement a groundwater monitoring program to demonstrate the effectiveness of the corrective action program. Such a monitoring program may be based on the requirements for a compliance monitoring program under 40 CFR 264.99 as incorporated by reference in ARM 16.44.702 and Condition IV.F. of this Permit.

5. Corrective action measures under this permit may be terminated once the concentration of hazardous constituents under 40 CFR 264.93 as incorporated by reference in ARM 16.44.702 and Condition IV.F. of this Permit meet the criteria of Condition IV.C. for a period of three consecutive years.

6. The Permittee shall continue corrective action measures during and beyond the compliance period for as long as necessary to achieve compliance with the groundwater protection standard.

7. The Permittee shall report semi-annually in writing to the Department on the effectiveness of the corrective action program.

8. If the Permittee determines that the corrective action is no longer needed or no longer satisfies the requirements of this section, he shall, within 90 days, submit an application for plan approval and permit modification to the Department.

9. The Permittee shall institute corrective action as necessary to protect human health and the environment for all releases of hazardous waste or constituents from any regulated unit at the facility, regardless of the time at which the waste was

applied in such unit. This requirement shall pertain for the life of the permit and through the closure/post-closure period for all regulated units at the facility.

H. COULSON DITCH

Coulson Ditch shall be sampled at the inlet and outlet of the New East Treatment Unit for the PHCs listed in Attachment IV.8. on a semi-annual basis for at least two years. Following this time, the data will be evaluated to assess if further sampling is necessary. Determination of the need to monitor will be based on the presence of PHCs in detectable levels from the eastern edge of the East Land Treatment Units compared to those at the western edge.

I. CLOSURE/POST-CLOSURE

1. Closure Period

a. During the closure period the Permittee shall,

i. Continue groundwater monitoring in compliance with Condition E of this Module, or

ii. If the hazardous waste management unit is in compliance monitoring at the time of closure, continue groundwater monitoring as specified in Condition F of this Module, or

iii. If the Permittee is engaged in a corrective action program at the beginning of closure, the Permittee shall continue groundwater monitoring in compliance with Condition F of this Module and comply with the corrective action program requirements specified in Condition G. of this Module.

b. By October 7, 1988, the Permittee shall submit to the Department an updated closure plan as required in Condition III.a.O.2. of the Permit to include, but not limited to a detection monitoring plan for all east land farm sectors.

c. If any sector of a land treatment unit identified in Condition II.A. of the Permit undergoes closure or post-closure while other sectors of the same unit remain in operation or closure:

   i. All groundwater monitoring wells identified in Condition A.5. of this Module shall continue to monitor both closed and operating sectors of the land treatment units.

   ii. The entire land treatment unit shall be considered an "operating unit" for groundwater monitoring purposes and shall comply with all conditions of this module.

   iii. The Permittee shall consider both closed and operating sectors of the land treatment unit as potential sources for contaminant migration in the event of detection of hazardous constituents in any monitoring well identified in Condition A.5. of this Module

   iv. Corrective action requirements in Condition G of this Module shall apply to the entire land treatment unit.

2. Post-Closure

a. The Permittee may monitor under this Condition if:

   i. All sectors of a land treatment unit have completed

closure in compliance with Condition III.a.0.2 of the Permit, and

ii. The land treatment unit is undergoing detection monitoring in compliance with Condition E of this Module at the beginning of the post-closure period as defined in Condition III.a.O.3.

b. During the post-closure care period, the Permittee shall:

i. Comply with the requirements of Condition III.a.0.3.

ii. Continue groundwater monitoring in compliance with Conditions IV.A through F. of the Permit except for the following:

The frequency of sampling and analysis is not semi-annual. Unless the regulated unit is under-going compliance monitoring as specified in Condition IV.F, the Permittee shall monitor groundwater on the following schedule:

- at the beginning of the post-closure period
- 6 months after the beginning of the post-closure period
- one year after the beginning of the post-closure period
- two years after the beginning of the post-closure period
- four years after the beginning of the post-closure period
- eight years after the beginning of the post-closure period
- sixteen years after the beginning of the post-closure period

- thirty years after the beginning of the post-closure period

During the post-closure period, the Department may decide that more frequent groundwater zone monitoring is necessary, at which time the Department will notify the Permittee in writing. The Permittee may sample more frequently during the post-closure period.

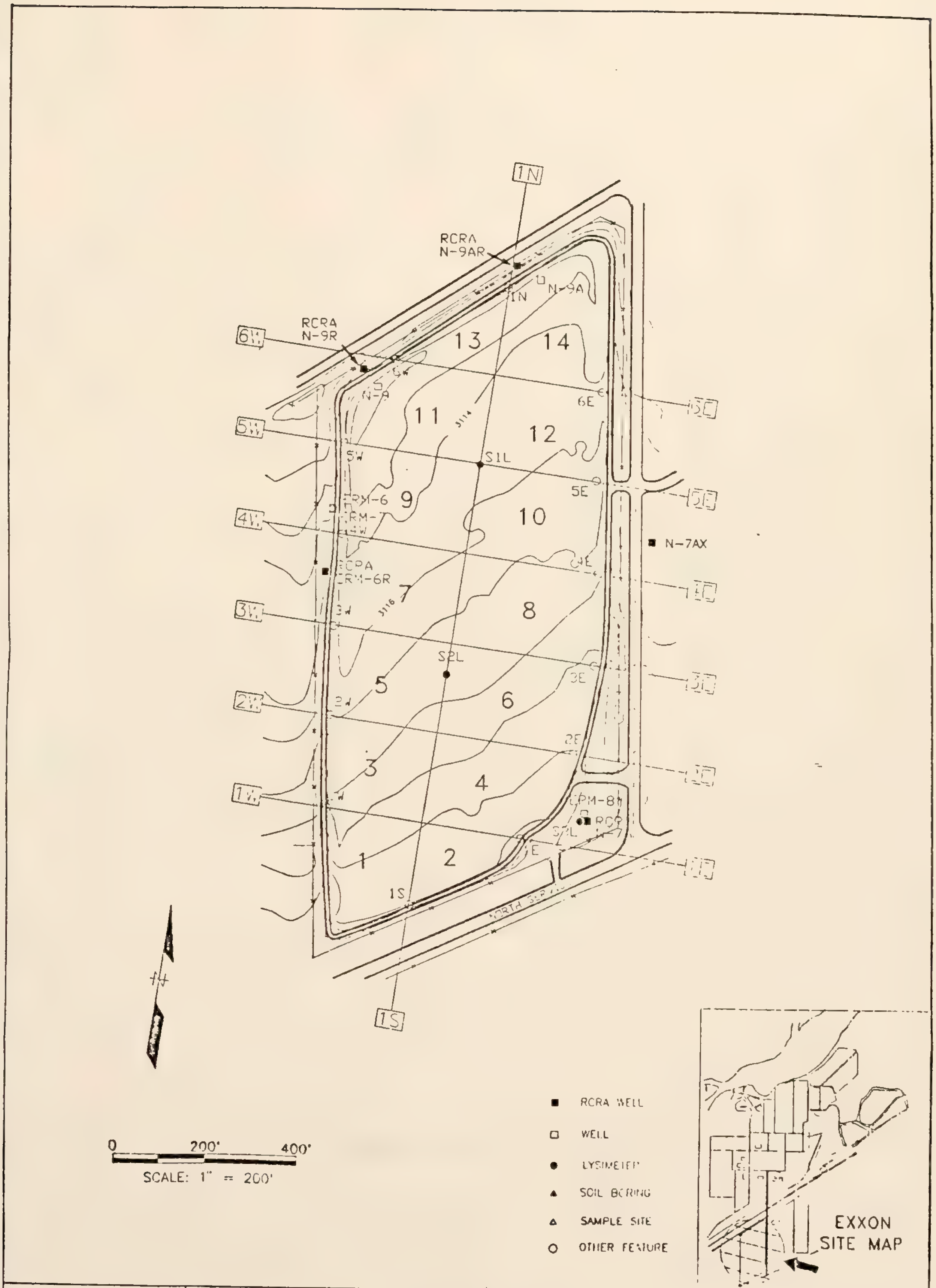
Attachments
Module IV
Groundwater Monitoring

List of Attachments

Module IV - Groundwater Monitoring

Attachment IV.1. South Land Treatment Unit
Attachment IV.2. New East and Old East Land Treatment Units
Attachment IV.3. Description of Wells
Attachment IV.4. Sampling and Analysis Procedures
Attachment IV.5. Groundwater Elevation Measurement Procedures
Attachment IV.6. Aquifer Flow Rates and Direction
Attachment IV.7. Monitoring Well Installation Requirements
Attachment IV.8. Principal Hazardous Constituents for Exxon
Attachment IV.9. Background Water Quality Parameters
Attachment IV.10. Appendix IX Parameters
Attachment IV.11. Groundwater Protection Constituents

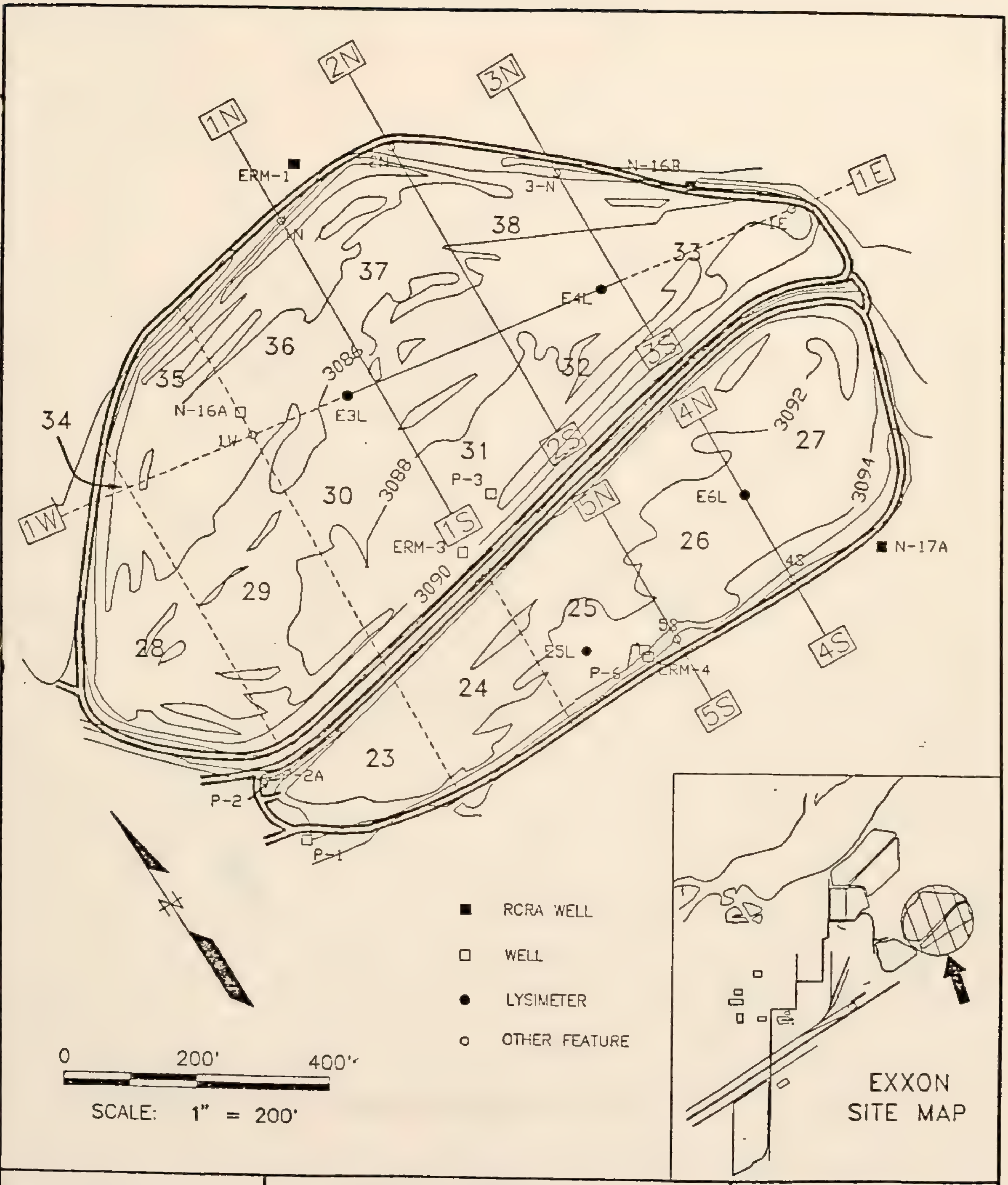
ATTACHMENT IV.1.



JULY,1988	EXXON COMPANY U.S.A. BILLINGS REFINERY SOUTH LAND TREATMENT UNIT	FIGURE 12-9

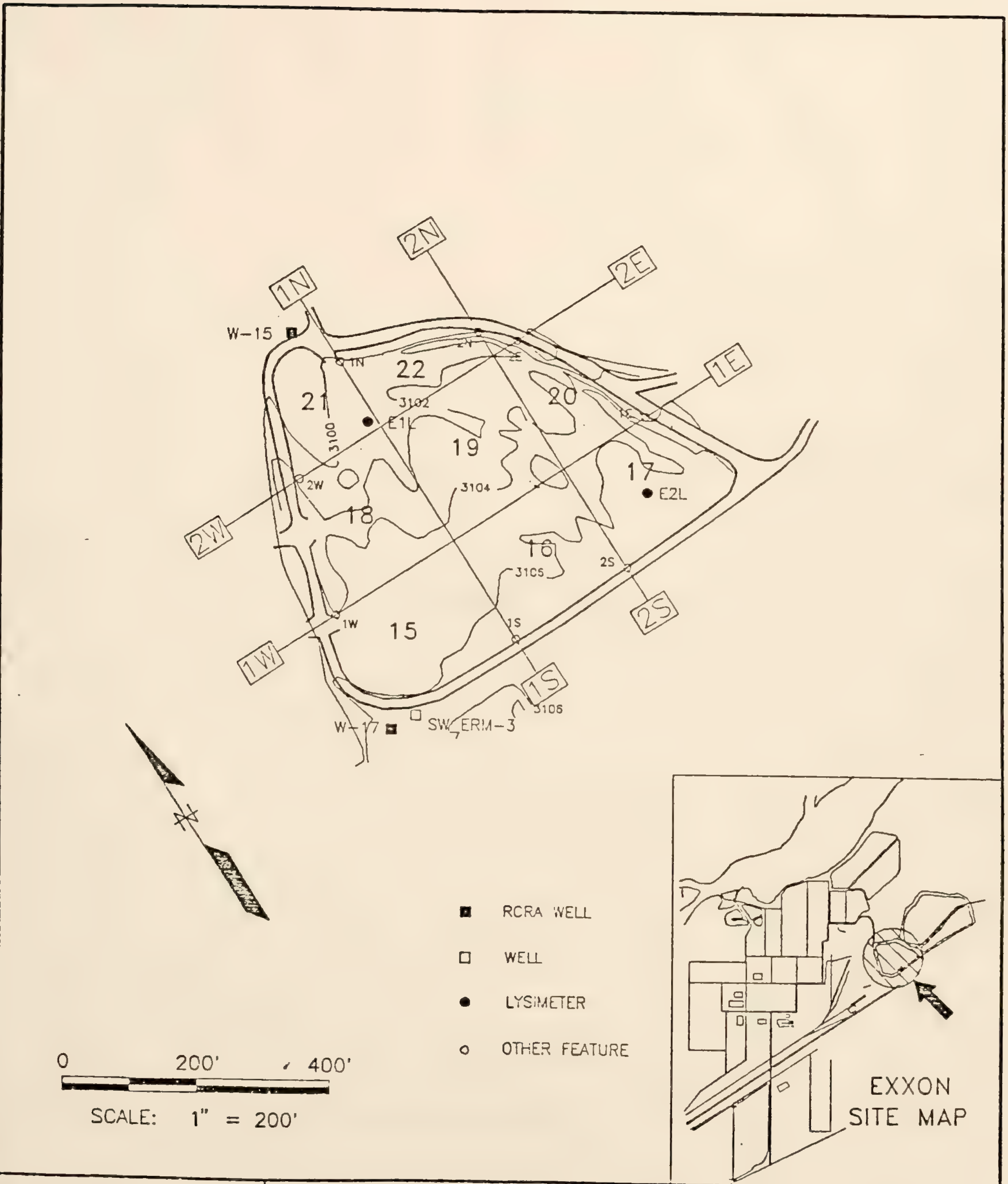
ATTACHMENT IV.2.

ATTACHMENT IV.2.a.



JULY,1988	EXXON COMPANY U.S.A. BILLINGS REFINERY NEW EAST LAND TREATMENT UNIT	FIGURE 12-10

ATTACHMENT IV.2.b.



JULY,1988

EXXON COMPANY U.S.A.
BILLINGS REFINERY

OLD EAST LAND TREATMENT UNIT

FIGURE 12-11

ATTACHMENT IV.3.

ATTACHMENT IV.3.
Description of Wells
(exerpted from the Application)

15.3.1 Description of Wells

Prior to 1981, all existing monitoring wells at the land treatment areas had been drilled into and screened in a deep gravel zone of the alluvial aquifer which underlies both sites but which is considerably below the top of the zone of saturation. Between Exxon and its groundwater consultants, it was concluded during 1980 and 1981 that, to be consistent with RCRA's

requirements for monitoring "the uppermost aquifer", all monitoring wells designated for use in the RCRA Ground Water Monitoring Program would be screened in the underlying gravel zone of the alluvial aquifer. This is further supported by the additional efforts in 1984 as described in Appendix 15.VII.

Drilling Programs

All RCRA-designated monitoring wells were drilled and completed during 1980 and 1981 as part of three drilling programs. These programs included drilling of additional alluvial wells for purposes other than that for RCRA monitoring. Thus, only drilling and completion reports of those wells eventually designated as part of the RCRA program are included here.

Weston (1981)

For this drilling program (W-series wells), a cable tool drill rig was used. This type of rig was operated by driving a steel casing down into the unconsolidated sediments several feet ahead of the cutting tool. Water then was added to the casing, and the cutting tool was used to break up and mix the sediments with the water in a cyclical up and down motion. When the water and sediments were thoroughly mixed, the resulting slurry was removed from the casing with a bailer. The casing then was driven ahead into the sediments and the entire process repeated. Water was added only until the well casing reached the groundwater level, at which point the sediments usually produced sufficient water to maintain the slurry. The drilling method required the use of 6-inch diameter steel casing for the initial hole.

Initially, commercial well screens were to be used in each of the W-series wells. However, after reviewing past reports, site conditions, and consultation with the drilling contractor, it was decided at the time that commercial well screens would result in unacceptable delays in the drilling program. Slots, approximately 0.125 inches wide, cut through the casing with a very fine-tipped cutting torch provided an acceptable substitute for commercial well screens (Weston, 1981).

Under this program, a typical well installation would proceed as follows. Each well site location was approved by Exxon. The rig was set up on the site, and drilling was initiated. The well was bailed continuously for approximately 15 minutes in order to develop it, clearing it of most of the finer sediments. Finally, a concrete collar, 1-2 ft. deep, was used to seal the annular space around the top of the well to prevent infiltration of surface runoff. Because the well casings were driven into place, a gravel pack around the screen section was not necessary or possible to replace.

All the RCRA-designated W-series wells installed during July and August 1980 under Weston's (1981) supervision consisted of 6-in. diameter steel casing driven to bedrock, with 10-20 ft. of slots extending upward from the bottom of the well. Concrete collars prevented surface infiltration, and removable caps were installed to prevent foreign contaminants from entering the well.

Northern Testing Laboratories (1981) - Nine additional wells were installed on the refinery site by Northern Testing Laboratories during October 1980 (N-series wells). These wells were installed using a hollow stem auger. The well casing was 2.5-in. diameter PVC pipe, with 10-15 ft. of commercially prepared PVC screen (slot size of 0.01 in.). The annular space was sealed with approximately 2 ft. of bentonite clay above the screen section and cuttings from the boring fill the remainder of the space.

ERM-Southwest Inc. (1981) - In September 1981, two wells used to fulfill RCRA monitoring at the two HWMAs were installed under the supervision of ERM-Southwest Inc., using mud rotary drilling as part of a more extensive drilling program. Mud was used to insure that the borehole would remain open to prevent sand and gravel deposits from collapsing into the hole during installation. These wells were drilled and screened into the underlying gravel. For each of the ERM-series wells, an 8-in. hole was drilled initially to the completion depth and 6-in. steel casing installed to the total depth. The hole then was cleaned out and developed slightly by bailing inside the 6-in. casing. PVC well screen and standpipe were then installed inside the casing and the annular space between the well screen and the 6-in. casing, sand packed the full length of the screen section as the steel casing was withdrawn. Well screens consisted of 1-1/2-in. I.D. PVC, 20-slot screen

which was threaded inside a 3-in. blank PVC standpipe extended 3 to 4 ft. above MSL. All pipe for the ERM-series wells was Schedule 80 PVC. Four stainless steel machine screws were used to secure each joint. A1- to 2-ft. bentonite seal then was placed above the sand pack and the hole backfilled to within two feet of the surface. A concrete seal was placed at the surface to secure the well and to minimize surface infiltration of runoff around the casing. Figure 15-12 shows a typical installed ERM-series well. Following installation of the ERM-series wells, both wells were developed by bailing out the mud and pumping to flush out the boreholes.

Northern Testing Laboratories (1983) - Four new wells have been drilled in the South Land Treatment Unit which are designed and constructed consistent with 40 CFR Part 264 regulations (they replace incorrect or damaged wells). The well logs are included in Appendix 15.V of this application.

Monitoring Well Equipment

In 1985, all wells were equipped with dedicated sampling pumps, groundwater elevation measurement devices, locking caps and concrete surface seals.

Network of Wells by HWMA

South Land Treatment Unit - The number and location of RCRA-designated monitoring wells were shown previously on Figure 15-1. The system in place and applicable to the 1982 baseline (Interim Status) period consisted of upgradient well N-7A and downgradient wells N-9, N-9A, and ERM-6. Wells N-9 and N-9A were redrilled due to improper location, being presently inside the dikes surrounding this land treatment unit. These relocated wells have been designated N-9R and N-9AR, respectively. These well relocations achieve compliance with both 40 CFR Part 265.91(a)(2) for Interim Status and 40 CFR Part 264.95(a) under the final permit conditions.

Downgradient will ERM-6 is damaged, apparently due to a collapsed screen. Because it has lost structural integrity and no longer is able to be sampled, it has been replaced with a new well (ERM-6R) in accordance with 40 CFR Part 265.91(c). This new well has been relocated approximately 100 ft. south of

its abandoned ERM-6, aligning it more directly downgradient (based on groundwater elevation measurements in this area) from the upgradient well N-7A and more adequately monitoring ground water under the west boundary of the South Land Treatment Unit (Figure 15-1).

In addition, a new upgradient well has been drilled, consistent with 40 CFR Part 265.91(a)(1) about 20 ft. east of the road bordering the east side of the South Land Treatment Unit. This additional upgradient well has been judged necessary due to the broad variability of monitored specific conductances in the ground water of the alluvial aquifer underlying the area. Its location (Figure 15-1) provides a better depiction of upgradient monitoring conditions for relocated downgradient wells N-9R and N-9AR. Ground-water flow direction, and thus any contaminant migration, is indicated in Figures 15-10 and 15-11 and is generally toward the Yellowstone River in that area. Screen depths for this network vary from approximately 16.5 ft. into the sand gravel aquifer (well N-7A) to 21 ft. (well N-9R). All new wells have been drilled to a depth of approximately 19 ft. into the sand gravel aquifer to maintain uniformity. These wells monitor nearly the entire depth of the alluvial aquifer and thus are capable of sampling the optimum range of aquifer conditions and potential contaminant types. Observed specific conductances in the area varies significantly with well depth. Existing RCRA monitoring well depths are shown on the monitoring well logs (Figures 15-13 through 15-16). New wells have been constructed in a manner very similar to existing wells, and consistent with 40 CFR Part 264.91(c) and 40 CFR Part 264.97(c). These well logs are included in Appendix 15.V.

East Land Treatment Unit - The existing RCRA-designated groundwater monitoring wells for the East Land Treatment Unit are shown on Figure 15-1. The Interim Status monitoring system included upgradient well W-17 and downgradient wells W-15, ERM-1, and N-16B. Well N-17A recently has been designated for inclusion in the RCRA monitoring program. Groundwater flow and thus any contaminant migration is shown to be generally toward the Yellowstone River (Figures 15-10 and 15-11). Well logs are given in Figures 15-17 through 15-21. In addition, samples from shallow well ERM-5, not included in the RCRA monitoring program, are being tested for standard indicator parameters as part of the Ground Water Assessment Plan only (Exxon,

1983b), due to the potential for groundwater quality influence from the Montana Sulphur and Chemical Company (MSCC) surface impoundment approximately 25 ft. south and upgradient of well ERM-5 and this land treatment area. However, this program does not incorporate well ERM-5 as part of the upgradient monitoring system, because it has not been completed into the sand-gravel aquifer that the other monitoring wells are completed in (ERM-Southwest Inc., 1981). Samples from that well will be included in the evaluation only if it is judged that the MSCC surface impoundment may be impacting water quality upgradient of the East Land Treatment Unit.

For purposes of the Ground Water Assessment Plan (Appendix 15.II), the northeast section of the East Land Treatment Unit will have an additional upgradient monitoring well by using existing well N-17A, which is almost directly upgradient from well N-16B. This will detect any groundwater quality variations which might occur from a livestock feedlot or other potential contaminant sources upgradient of the East Land Treatment Unit boundary.

Assurance of Upgradient and Downgradient Water Measurement

Ground-water flow direction as indicated previously in Figures 15-10 and 15-11 reflects that the designated upgradient wells (Figure 15-1) are properly located to adequately represent background water quality and not be affected by the HWMA. The designated downgradient wells indicated by these figures are judged to be of sufficient number and in the proper locations to monitor ground water at the compliance point. See Appendix 15.VII for additional background. Concerning well depths, their adequacy is evaluated as follows and in Appendix 15.VII:

1. All proposed wells in the South Land Treatment Unit have been drilled about 17 ft. into the existing alluvial gravel aquifer. This depth provides uniformity and should include nearly the entire range of the alluvial aquifer. This enables sampling for materials of varying density.

2. The depths of RCRA-designated wells for the East Land Treatment Unit into the gravel aquifer are as follows:

Well No.	Completed Portion In Alluvial Aquifers (ft.)	Shale Bedrock Depth (ft.)
W-17 (Upgradient)	15	45
N-17A (Upgradient)	11	39
ERM-1 (Downgradient)	10	--
W-15 (Downgradient)	12.5	40
N-16B (Downgradient)	15	--

While the depths vary somewhat, most of the wells are completed to bedrock. The relative shallow depths of well ERM-1 compared to the other wells may lend itself to higher concentrations of natural occurring inorganics (such as sulfates and specific conductances); however, it is not planned to redrill this well.

Based on the above discussion, the proposed downgradient ground water monitoring wells can be expected to adequately measure groundwater quality at the compliance points. This is indicated in a letter of certification by a qualified hydrogeology expert in the Ground Water Assessment Plan (see Appendix 15.II). Additional support is provided in a follow-up report contained here as Appendix 15.VII.

ATTACHMENT IV.4.

ATTACHMENT IV.4.
Sampling and Analysis Procedures
(exerpted from the Application)

15.3.2 Sampling/Analysis Procedures

The following section addressing 40 CFR Part 264.97(d), derived from ERM-Southwest Inc. (1981), provides the sampling and analysis plans, and analytical procedures and addressed chain-of-custody control of samples for the ground water monitoring of the two HWMAs. These units are: (1) the East Land Treatment Unit, and (2) the South Land Treatment Unit. This section provides a sampling and analysis plan consistent with Federal regulations relating to ground water monitoring of hazardous waste facilities.

Sampling Techniques

Prior to 1985, all wells were sampled by manual bailing or pumping after removing at least three times the well volume. The specific steps were as follows:

1. Ground-water levels in each well were measured and recorded in a data collection notebook as an initial step to the field sampling procedure. The device used to measure depth to water were noted, as well as any field observations affecting the measurements (weather, color of sample, ease of sampling, etc.).

2. All wells were bailed or pumped to remove at least three times the well volume. Well volumes were estimated based on the length of the column of water in the well using the water level elevation mentioned above. Dedicated standard bailers (1.5 in. I.D. by 3 ft. PVC) supplied for sampling each well remove approximately 0.25 gallons, if filled near capacity.

3. Each RCRA monitoring well was equipped with an individual length of polyethylene tubing which could be attached to a surface suction pump to evacuate the wells.

4. After a given well had been evacuated for the desired water volume, the well bailer was used to obtain groundwater samples for analysis. Care was taken to use the proper preservation techniques consistent with USEPA (1980) (See Table 15-8) and obtain the appropriate number of multiple replicates (four) for each well. Proper sampling bottles were supplied by the commercial laboratory conducting the required chemical analyses. Filtering of samples obtained for trace metals were performed prior to "fixing" with acid. Suitable "disposable filtering packs" were available from Nalgene or from Millipore. Filter medium was glass fiber, 0.45-micron pore size. Acid-fixing without filtering could lead to erroneously high results, especially for lead and total chromium.

During 1985 all wells were equipped with locking, dedicated positive displacement bladder well pumps and ground water elevation detection devices that would eliminate the potential for cross contamination. Approximate pump depths are shown in Table 15-18. The specific steps followed since installation and which will continue to be used are:

1. Ground-water levels in each well are measured and recorded in a data collection notebook as an initial step to the field sampling procedure. The device used to measure depth to water should be noted, as well as any field observations affecting the measurements (weather, color of sample, ease of sampling, etc.). Currently using an "Olympic Well Probe".

2. All wells will be pumped, using the dedicated pump, to remove at least three times the well volume. Well volumes will be estimated based on the length of the column of water in the well using the water level elevation determined above and the pumping rate at each well. The initial volumes will be visually inspected for the presence of immiscible liquids by observing any scheen.

3. After a given well has been evacuated for the desired water volume, the dedicated well pump will be used to obtain groundwater samples for analysis. Care will be taken to use the proper preservation techniques and pumping rates consistent with USEPA (1980) (See Table 15-8) and obtain, as appropriate, the volume and number of representative samples for each well. Proper sampling bottles containing any preservatives are supplied by the commercial laboratory conducting the required chemical analyses. None of the samples are filtered since all waters are quite clear. Samples are immediately iced and delivered to the local laboratory or packaged in coolers for shipment (with proper chain of custody forms) to the commercial laboratory.

Table 15-8 includes preservation techniques used for the required chemical analyses, as well as additional techniques used during Interim Status.

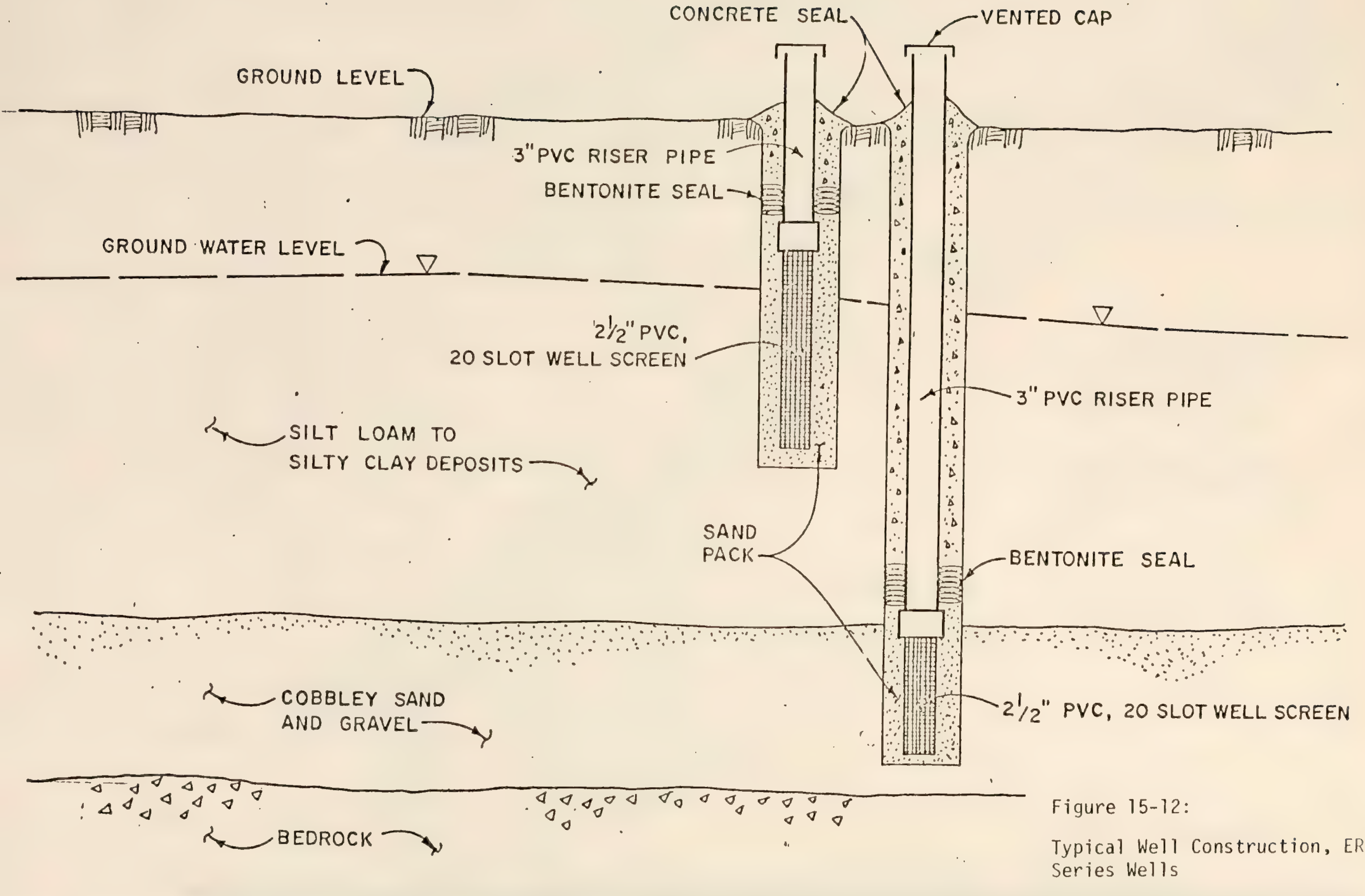
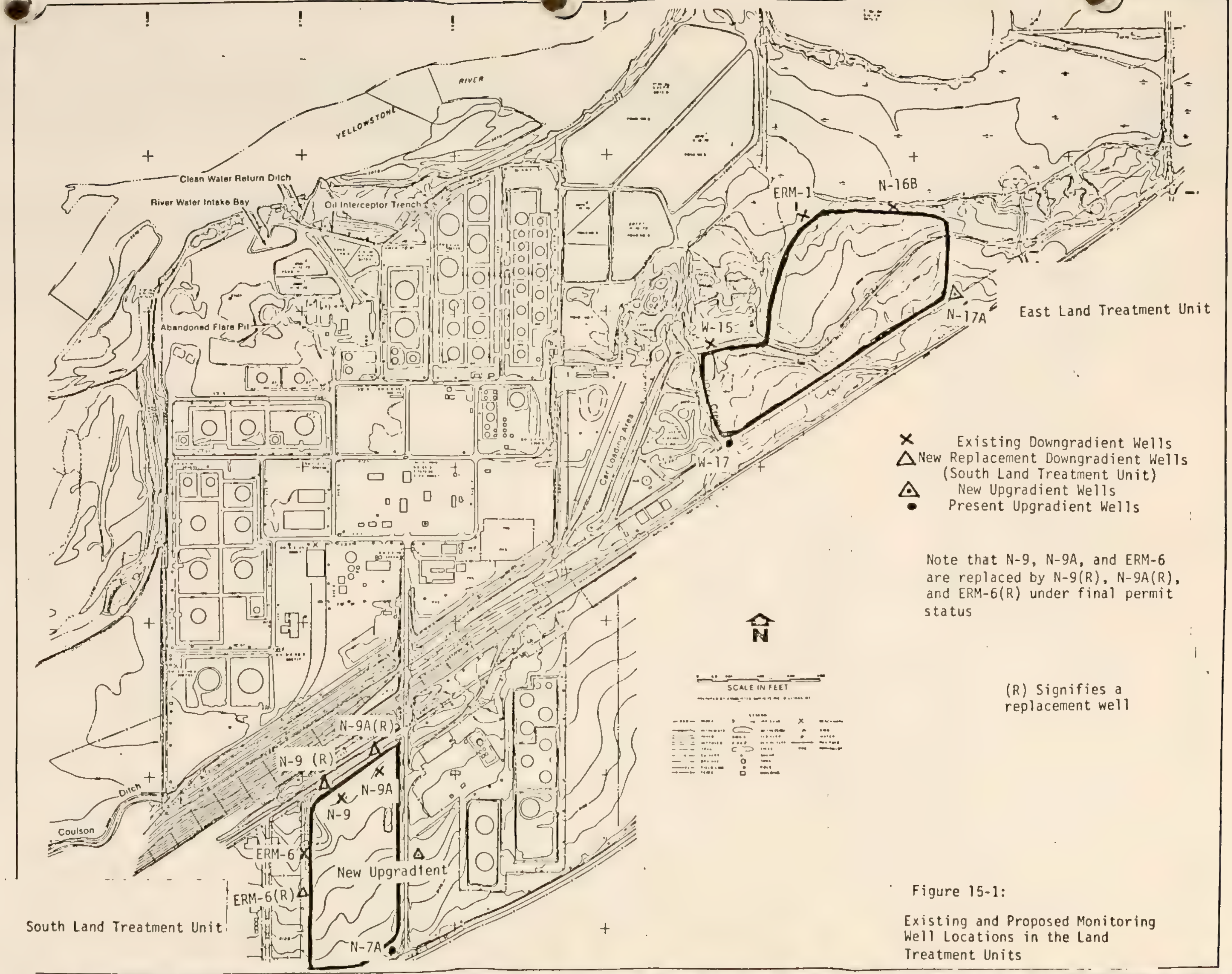


Figure 15-12:

Typical Well Construction, ERM
Series Wells



× Existing Downgradient Wells

△ New Replacement Downgradient Wells (South Land Treatment Unit)

△ New Upgradient Wells

● Present Upgradient Wells

Note that N-9, N-9A, and ERM-6 are replaced by N-9(R), N-9A(R), and ERM-6(R) under final permit status

(R) Signifies a replacement well

Figure 15-1:

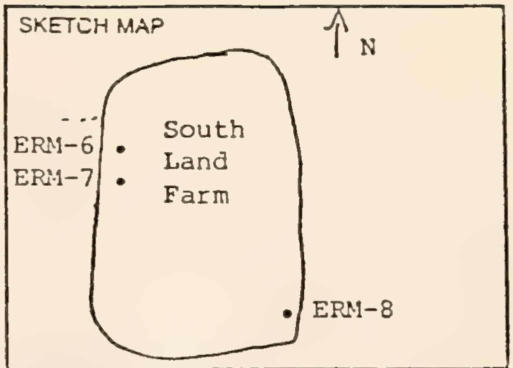
Existing and Proposed Monitoring Well Locations in the Land Treatment Units

ENVIRONMENTAL RESOURCES MANAGEMENT, INC.

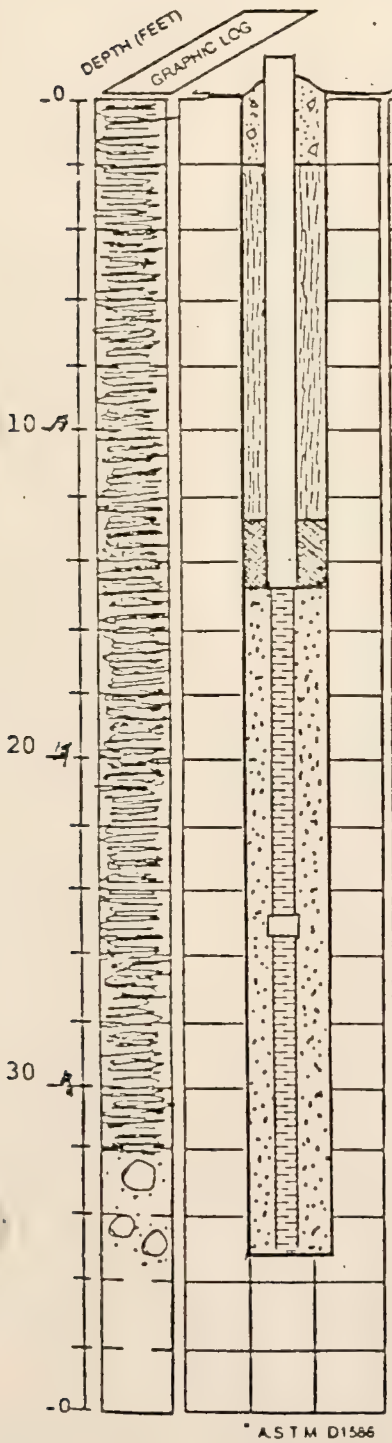
DRILLING LOG

PROJECT: Exxon
OWNER: Exxon, USA
LOCATION: Billings, Montana
ADDRESS:
WELL NUMBER: ERM-6
TOTAL DEPTH: 35 feet
SURFACE ELEVATION:
WATER LEVEL:
DRILLING COMPANY: Digger Drilling
DRILLING METHOD: Mud Rotary
DATE DRILLED: 9/5/81
DRILLER: Ted Benes
HELPER:
LOG BY: Henry Lord

SKETCH MAP



NOTES:



DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)

Dark Brown

Clay Loam and Silty Clay

Sandy Gravel

Figure 15-13:

Well ERM-6 Log
South Land Treatment Area

* ASTM D1586

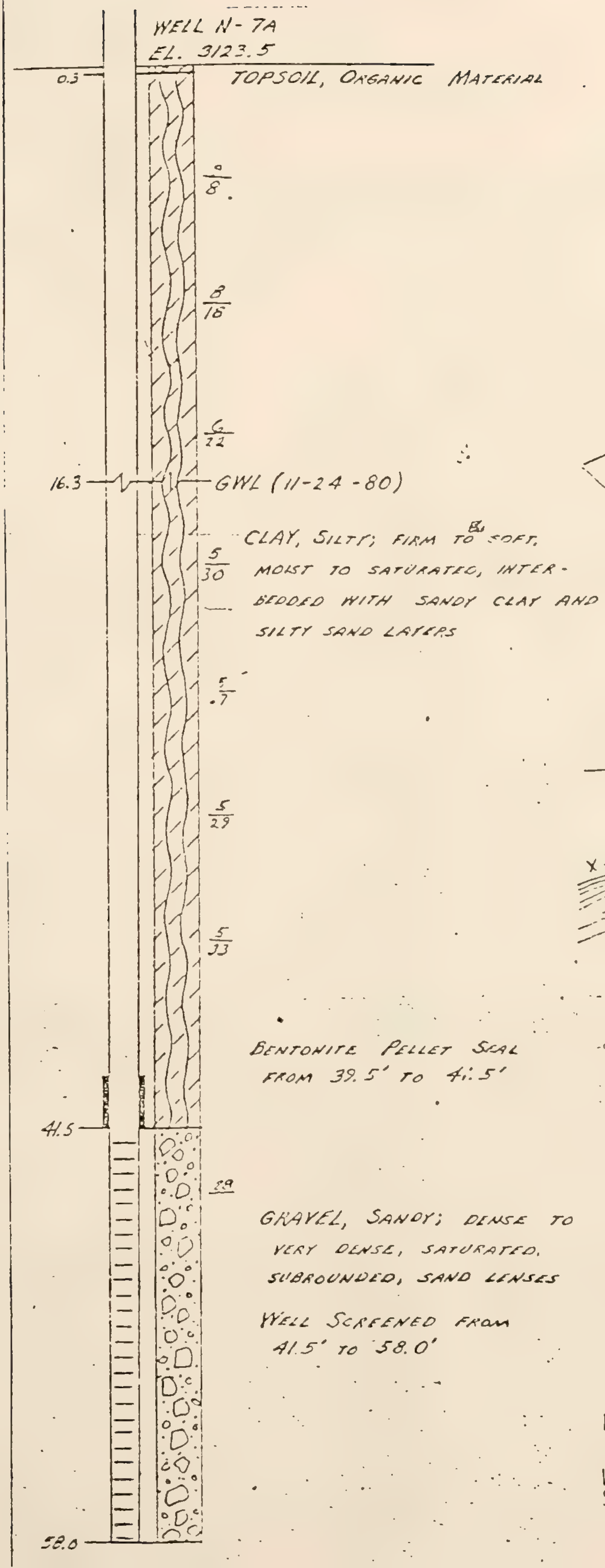
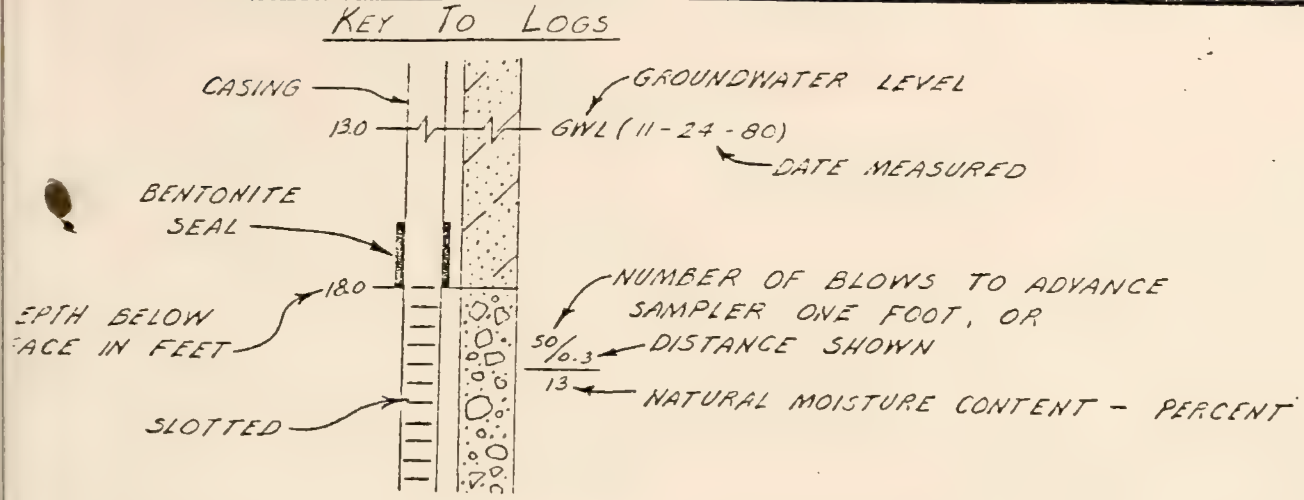

WELL N-7A
EL. 3123.5
0.3
TOPSOIL, ORGANIC MATERIAL
0/8
8/16
6/22
16.3
GWL (11-24-80)
CLAY, SILTY; FIRM TO & SOFT, MOIST TO SATURATED, INTERBEDDED WITH SANDY CLAY AND SILTY SAND LAYERS
5/30
5/7
5/29
5/33
BENTONITE PELLET SEAL FROM 39.5' TO 41.5'
41.5
29
GRAVEL, SANDY; DENSE TO VERY DENSE, SATURATED, SUBROUNDED, SAND LENSES
WELL SCREENED FROM 41.5' TO 58.0'
58.0

Figure 15-14:

Well N-7A Log
South Land Treatment Area



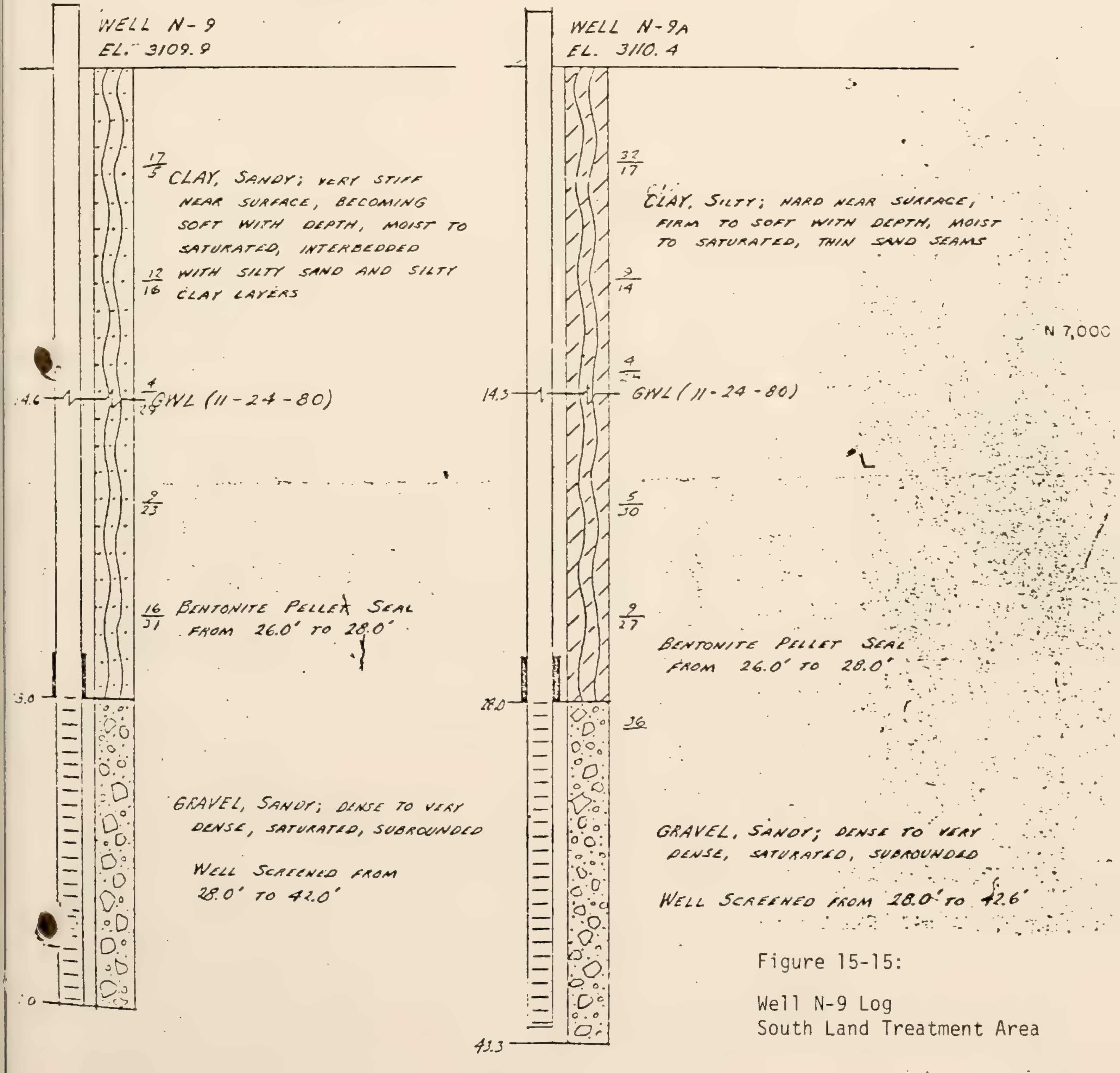

WELL N-9
EL. 3109.9
17/5
CLAY, SANDY; VERY STIFF NEAR SURFACE, BECOMING SOFT WITH DEPTH, MOIST TO SATURATED, INTERBEDDED WITH SILTY SAND AND SILTY CLAY LAYERS
12/16
14.6
4/29
GWL (11-24-80)
9/23
16/31
BENTONITE PELLET SEAL FROM 26.0' TO 28.0'
3.0
GRAVEL, SANDY; DENSE TO VERY DENSE, SATURATED, SUBROUNDED
WELL SCREENED FROM 28.0' TO 42.0'
0
WELL N-9A
EL. 3110.4
32/17
CLAY, SILTY; HARD NEAR SURFACE, FIRM TO SOFT WITH DEPTH, MOIST TO SATURATED, THIN SAND SEAMS
3/14
4/24
14.3
GWL (11-24-80)
5/30
9/27
BENTONITE PELLET SEAL FROM 26.0' TO 28.0'
28.0
36
GRAVEL, SANDY; DENSE TO VERY DENSE, SATURATED, SUBROUNDED
WELL SCREENED FROM 28.0' TO 42.6'
43.3
N 7,000

Figure 15-15:

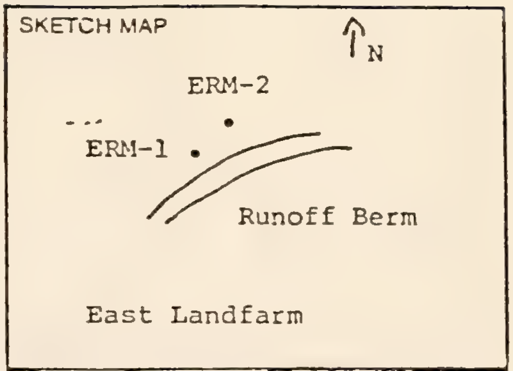
Well N-9 Log
South Land Treatment Area

ENVIRONMENTAL RESOURCES MANAGEMENT, INC.

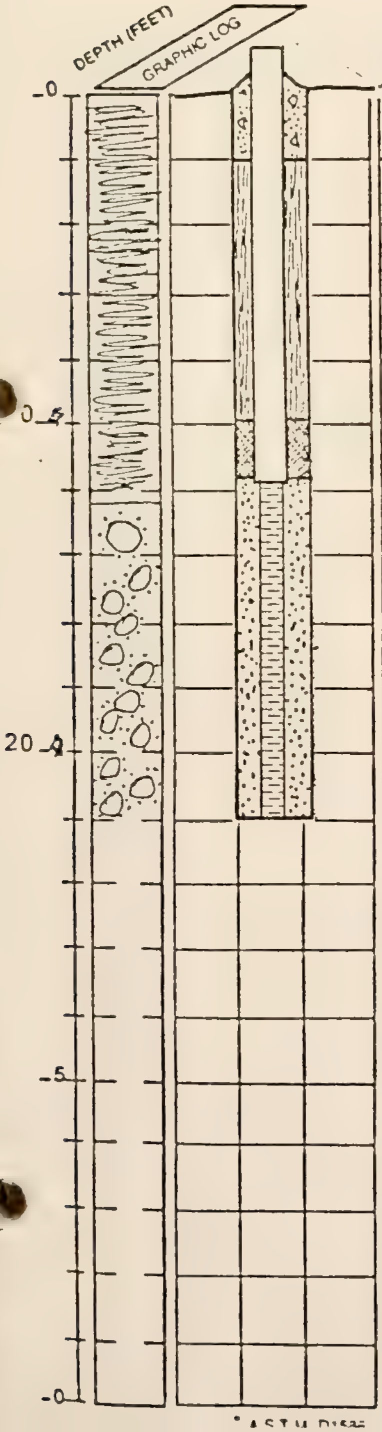
DRILLING LOG

PROJECT: Exxon
OWNER: Exxon, USA
LOCATION: Billings, Montana
ADDRESS:
WELL NUMBER: ERM-1
TOTAL DEPTH 22 feet
SURFACE ELEVATION:
WATER LEVEL:
DRILLING COMPANY: Digger Drilling
DRILLING METHOD: Mud Rotary
DATE DRILLED: 9/3/81
DRILLER: Ted Benes
HELPER:
LOG BY: Henry Lord

SKETCH MAP



NOTES:



DESCRIPTION / SOIL CLASSIFICATION
(COLOR, TEXTURE, STRUCTURES)

Dark Brown

Heavy Fine Sandy Loam

Saturated at 6 Feet

No elev.

Cobbley, Sandy Gravel

Figure 15-17:

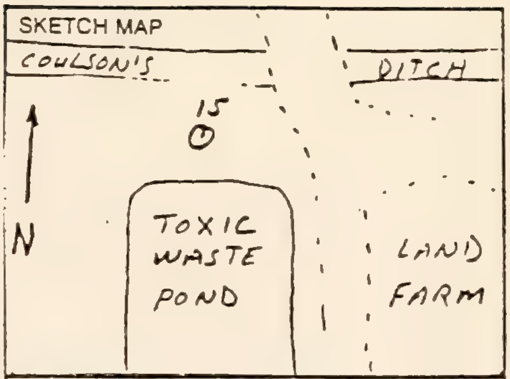
Well ERM-1 Log
East Land Treatment Area

WESTON

DRILLING LOG

WELL NUMBER: 15
OWNER: Exxon-USA
LOCATION: North side of toxic waste pond, between pond & Coulson's Ditch
ADDRESS: Billings, MT
TOTAL DEPTH: 40'
SURFACE ELEVATION:
WATER LEVEL: 10.5'
DRILLING COMPANY: Pinnow
DRILLING METHOD: cable tool
DATE DRILLED: 8/4/80
DRILLER: Pinnow
HELPER:
LOG BY: Tomalavage

SKETCH MAP



NOTES:

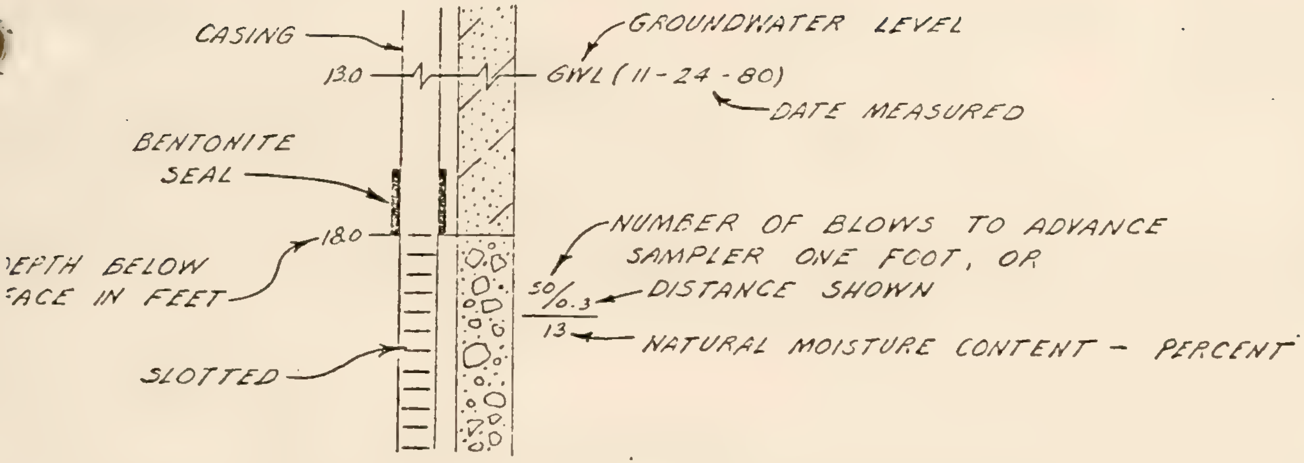
Depth (feet)	Graphic log	Sample number	Sample type	Sample blows*	Description / Soil classification (Color, texture, structures)
0					Silty sand fill.
					Gray sandy clay, water saturated starting at 12'.
5					
10					
15					
20					
25					Vari-colored fine sand.
30					Vari-colored medium sand with gravel.
35					
40					Vari-colored fine to medium sand
					shale at 40' - bottom of hole.
					6" dia. steel casing, field slotted 40 - 20'.

Figure 15-18:

Well W-15 Log
East Land Treatment Area

* ASTM D1586

KEY TO LOGS



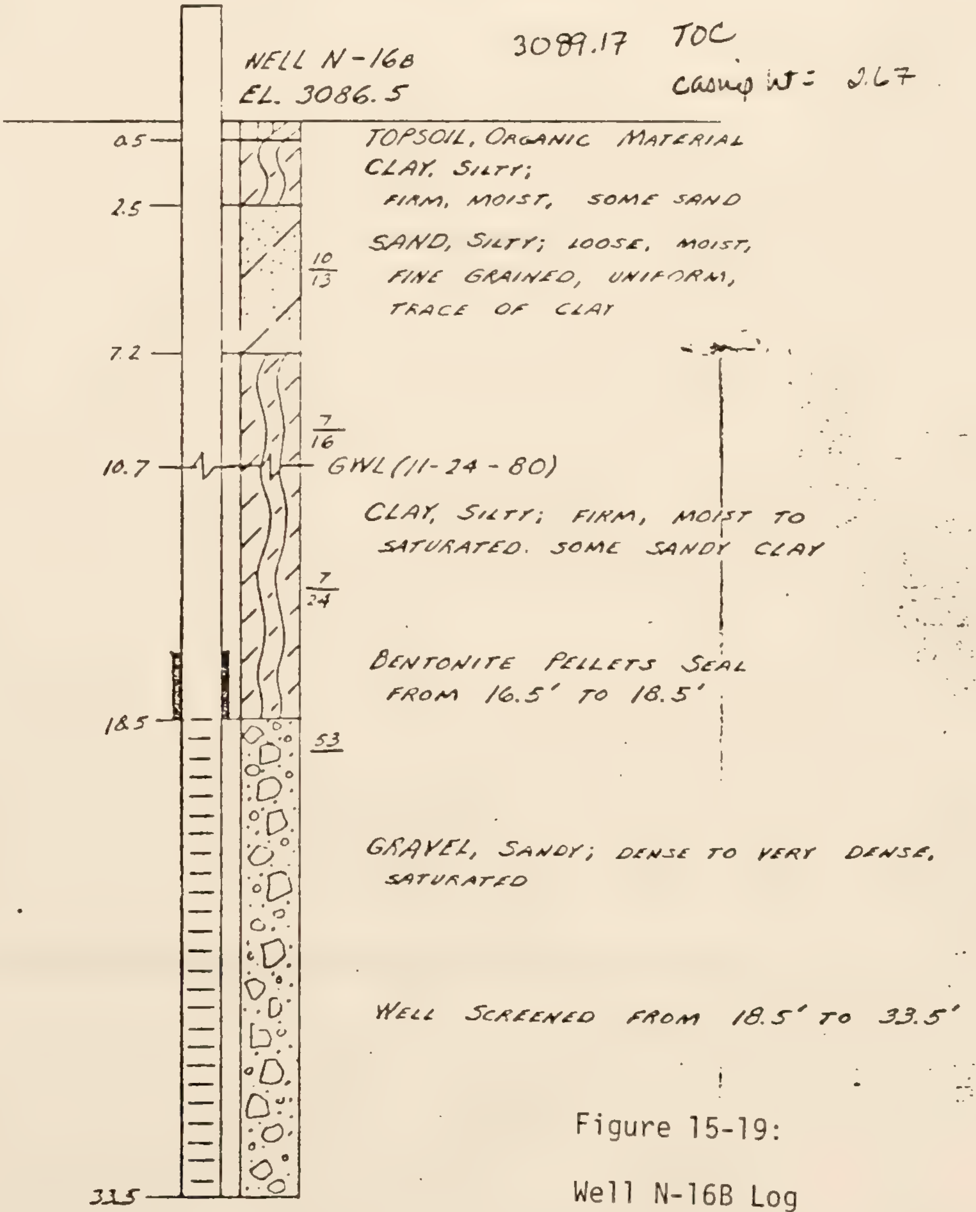

WELL N-16B
EL. 3086.5
3089.17 TOC
casing ht = 2.67
0.5
TOPSOIL, ORGANIC MATERIAL
CLAY, SILTY; FIRM, MOIST, SOME SAND
2.5
SAND, SILTY; LOOSE, MOIST, FINE GRAINED, UNIFORM, TRACE OF CLAY
10/13
7.2
7/16
10.7
GWL (11-24-80)
CLAY, SILTY; FIRM, MOIST TO SATURATED. SOME SANDY CLAY
7/24
BENTONITE PELLETS SEAL FROM 16.5' TO 18.5'
18.5
53
GRAVEL, SANDY; DENSE TO VERY DENSE, SATURATED
WELL SCREENED FROM 18.5' TO 33.5'
33.5

Figure 15-19:

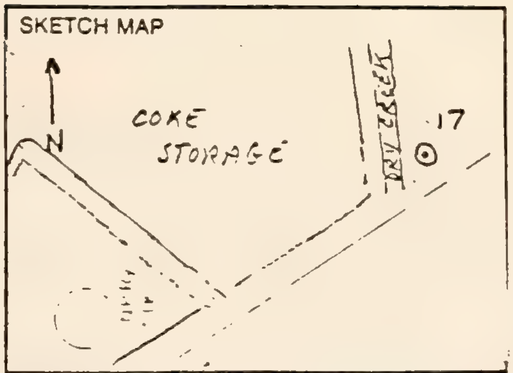
Well N-16B Log
East Land Treatment Area

WESTON

DRILLING LOG

WELL NUMBER: 17
OWNER: Exxon-USA
LOCATION: Southeast corner of coke storage area on east side of Dry Creek
ADDRESS: Billings, MT
TOTAL DEPTH: 45'
SURFACE ELEVATION:
WATER LEVEL: 11.3'
DRILLING COMPANY: Pinnow
DRILLING METHOD: cable tool
DATE DRILLED: 8/5/80
DRILLER: Pinnow
HELPER:
LOG BY: Tomalavage

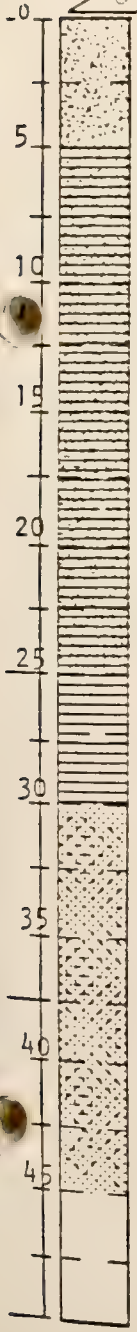
SKETCH MAP



NOTES:

DEPTH (FEET) | GRAPHIC LOG | SAMPLE NUMBER | SAMPLE TYPE | SAMPLE BLOWS*

DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)



Black-gray silty sand fill.

Gray silty clay.

Yellow-brown clay.

Vari-colored medium sand with gravel

shale at 45' - bottom of hole.

Figure 15-20:

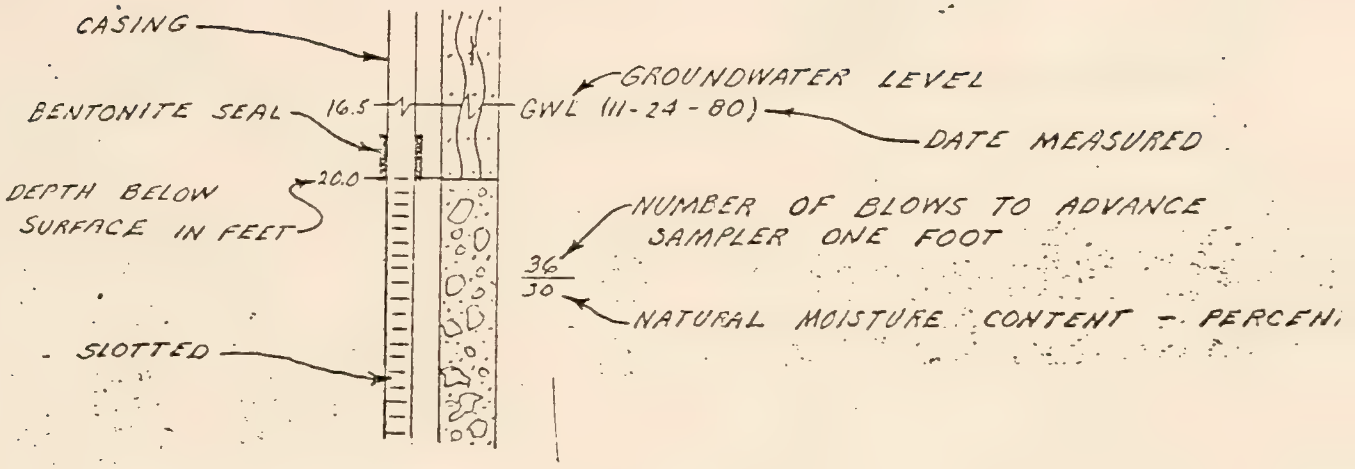
Well W-17 Log
East Land Treatment Area

6" dia. steel casing, field slotted 45' - 25'.

* ASTM D1586

SHEET 1 OF 1

KEY TO LOGS


CASING
BENTONITE SEAL
16.5
GROUNDWATER LEVEL
GWL (11-24-80)
DATE MEASURED
DEPTH BELOW SURFACE IN FEET
20.0
NUMBER OF BLOWS TO ADVANCE SAMPLER ONE FOOT
36/30
NATURAL MOISTURE CONTENT - PERCEN
SLOTTED

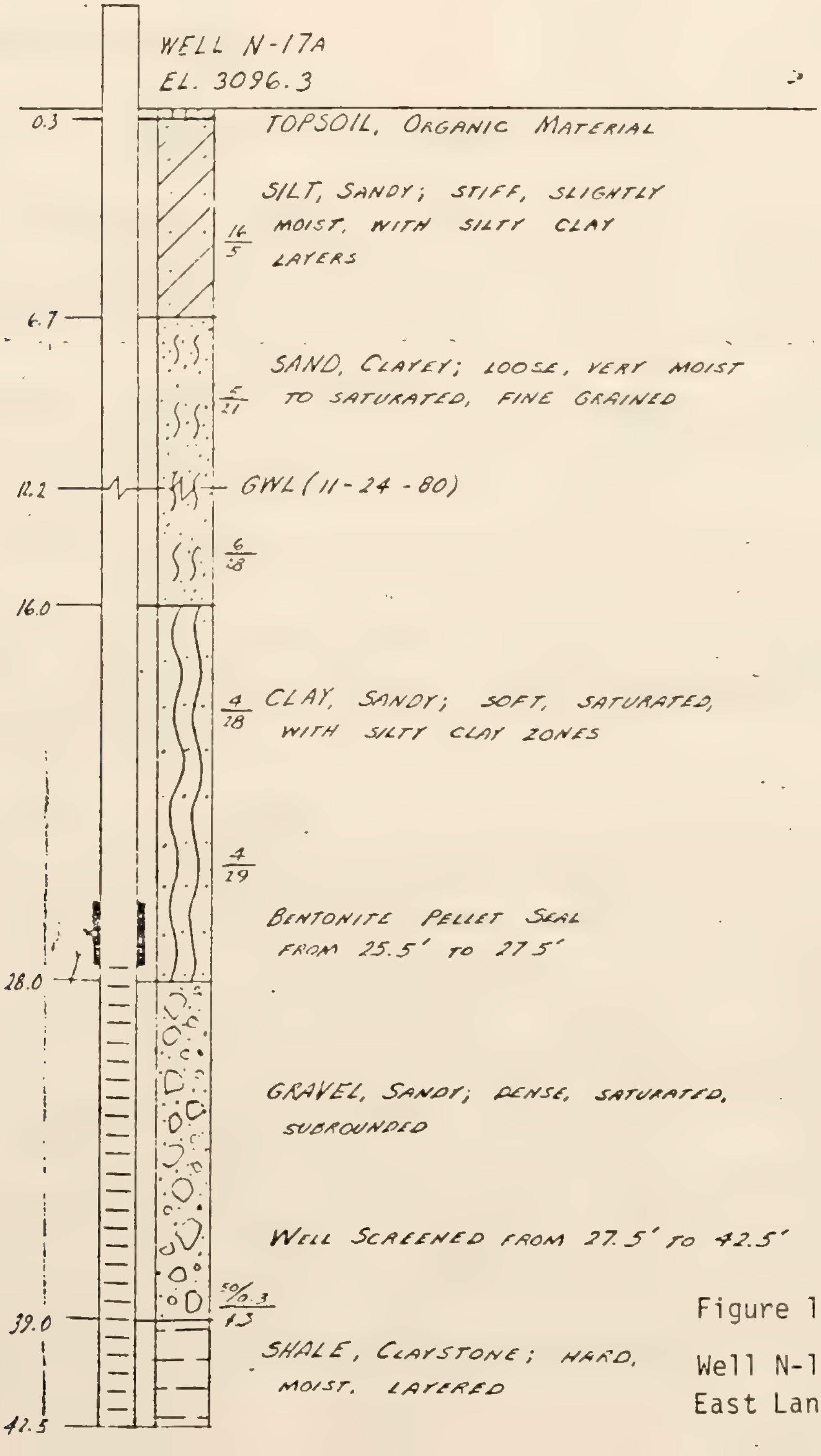

WELL N-17A
EL. 3096.3
0.3
TOPSOIL, ORGANIC MATERIAL
SILT, SANDY; STIFF, SLIGHTLY MOIST, WITH SILTY CLAY LAYERS
16/5
6.7
SAND, CLAYEY; LOOSE, VERY MOIST TO SATURATED, FINE GRAINED
5/21
11.2
GWL (11-24-80)
6/18
16.0
CLAY, SANDY; SOFT, SATURATED, WITH SILTY CLAY ZONES
4/28
4/29
BENTONITE PELLET SEAL FROM 25.5' TO 27.5'
28.0
GRAVEL, SANDY; DENSE, SATURATED, SUBROUNDED
WELL SCREENED FROM 27.5' TO 42.5'
50/0.3
13
39.0
SHALE, CLAYSTONE; HARD, MOIST, LAYERED
42.5

Figure 15-21:

Well N-17A Log
East Land Treatment Area

15.3.4 Ground-water Elevation

The procedure for measurement of groundwater elevations is as follows:

1. A standard data collection notebook will be provided to field personnel for recording these levels and other comments (weather, color of sample, ease of sampling, etc.) by the collector.

2. The depth to water for each well should be measured from the top of the well casing and recorded in the field logbook.

3. The depth to water should be recorded before any pumping takes place.

4. The dedicated device used in each well is an "Olympic Well Probe" by the ACTAT Corporation (or equivalent) which is an electric conductance measuring instrument.

Ground-water levels are measured with the electric conductance measuring instrument by lowering the end until it reaches the groundwater level in the well where a circuit is completed, showing an indication on the meter (light or buzzer). The length of the probe is measured, giving distance from the groundwater level to the known elevation of the well-casing top (from top of case). All interim status groundwater evevations have been provided in Table 15-1.

Monitoring data on groundwater elevations will be collected with each sampling and evaluated annually to insure that designation of upgradient and downgradient wells within the RCRA-designated alluvial aquifer system at the refinery site is still valid. If not, the groundwater monitoring program's well configuration will be revised to assure appropriate upgradient and downgradient wells.

Table 15-1. GROUND WATER ELEVATION DATA

Well	Date	TOC[1]	-	FTOC	=	Ground Water Elevation	FTOL
East Landtreatment Unit							
N16B	2/17/82	3089.17'		14.75'		3074.42'	
	5/14/82			14.50'		3074.67'	
	8/19/82			10.83'		3078.25'	
	11/2/82			14.75'		3074.42'	
	4/25/83			14.83'		3074.33'	
	7/27/83			13.61'		3075.59'	
	8/2/83			13.86'		3075.34'	
	8/8/83			13.95'		3075.25'	
	8/30/83			14/53'		3074.67'	
	10/13/83			14.28'		3074.92'	
	2/7/84			14.70'		3074.50'	
	3/6/84			14.70'		3074.50'	
	4/12/84			14.70'		3074.50'	
	5/3/84			14.70'		3074.50'	
	5/22/84			13/75'		3075.75'	
	5/30/84			13.20'		3076.00'	
	6/30/84			13.24'		3075.96'	
	* 7/10/84			13.20'		3076.00'	
	8/10/84			14.00'		3075.20'	
	9/18/84			14.36'		3074.84'	
	11/13/84			14.60'		3074.62'	
	11/15/84			15.00'		3074.20'	
	4/25/85			15.17'		3074.03'	
	5/1/85			15.00'		3074.20'	
	5/3/85			14.58'		3074.62'	
	5.24/85			13.56'		3075.64'	
	6/19/85			13.37'		3075.83'	
	11/20/85			15.14'		3074.03'	
	1/7/86			15.05'		3074.12'	
	7/23/86			14.03'		3075.14'	
	11/18/86			14.64'		3074.53'	
ERM-1	2/17/82	3084.17'		8.75'		3075.42'	
	5/14/82			8.50'		3075.67'	
	8/19/82			8.67'		3075.50'	
	11/2/82			8.08'		3076.08'	
	4.25/83			8.67'		3075.50'	
	7/27/83			7/80'		3076.34'	
	8/2/83			7.85'		3076.29'	
	8/8/83			8.47'		3075.67'	
	8/30/83			8.30'		3075.84'	
	10/13/83			8.14'		3076.00'	
	11/23/83			8.17'		3075.97'	
	2/7/84			8.22'		3075.22'	
	3/6/84			8.22'		3075.92'	
	4/12/84			8.39'		3075.75'	
	5/3/84			8.39'		3075.75'	

Table 15-1. GROUND WATER ELEVATION DATA

Well	Date	TOC[1]	-	FTOC	=	Ground Water Elevation
East Landtreatment Unit						
ERM-1 (cont.)	+ 5/14/84			7.24'		3076.90'
	5/22/84			7.72'		3076.42'
	5/30/87			7.64'		3076.50'
	6/30/84			7.30'		3076.84'
	* 7/10/84			7.55'		3076.59'
	8/10/84			7.92'		3076.22'
	9/18/84			8.14'		3076.00
	11/15/84			8.67'		3075.47'
	4/25/85			8.83'		3075.31'
	5/1/85			8.92'		3075.22'
	5/3/85			8.58'		3075.56'
	6/19/85			8.00'		3076.14'
	11/20/85			8.33'		3075.81'
	7/29/86			8.12'		3076.02'
	11/18/86			8.17'		3075.97'
W-15	2/18/82	3096.25'		11.33'		3084.92'
	5/14/82			22.25'		3073.92'
	8/19/82			11.00'		3085.17'
	11/2/82			11.17'		3084.08'
	4/25/83			13.00'		3083.25'
	7/27/83			10.83'		3085.42'
	8/2/83			11.00'		3085.25'
	8/8/83			10.92'		3085.33'
	8/30/83			11.28'		3084.97'
	10/13/83			11.21'		3085.04'
	11/23/83			11.96'		3084.29'
	2/7/84			12.12'		3084.13'
	3/6/84			11.93'		3084.33'
	4/12/84			12.58'		3083.67'
	5/3/84			12.67'		3083.58'
	+ 5/14/84			12.08'		3084.17'
	5/21/84			11.88'		3084.37'
	5/22/84			11.54'		3084.71'
	6/30/84			10.42'		3085.83'
	* 7/10/84			10.21'		3086.04'
	8/10/84			10.42'		3085.83'
	9/18/84			11.00'		3085.25'
	11/16/84			12.44'		3083.92'
	4/25/85			12.33'		3082.75'
	5/1/85			13.41'		3082.83'
	5/3/85			12.67'		3083.58'
	5/24/85			12.10'		3084.15'
	6/19/85			11.29'		3084.96'
	11/20/85			11.83'		3084.42'
	7/28/86			11.79'		3084.46'
	11/17/86			12.50'		3083.75'

Table 15-1. GROUND WATER ELEVATION DATA

Well	Date	TOC[1]	-	FTOC	=	Ground Water Elevation
East Landtreatment Unit						
W-17	2/18/82	3105.75'		14.91'		3090.91'
	5/14/82			17.08'		3088.67'
	8/19/82			12.75'		3093.00'
	11/2/82			17.67'		3088.08'
	4/25/83			17.25'		3088.50'
	7/27/83			14.23'		3091.50'
	8/2/83			13.48'		3092.25'
	8/8/83			13.81'		3091.92'
	8/30/83			13.40'		3092.33'
	10/13/84			14.69'		3091.04'
	2/7/84			15.65'		3090.08'
	3/6/84			15.56'		3090.17'
	4/12/84			16.15'		3089.58'
	5/3/84			17.40'		3088.33'
	† 5/21/84			17.25'		3088.48'
	5/22/84			16.81'		3088.92'
	5/30/84			15.90'		3089.83'
	6/30/84			13.80'		3091.92'
	* 7/10/84			13.31'		3092.42'
	8/10/84			13.50'		3092.13'
	9/18/84			14.23'		3091.50'
	11/16/84			15.58'		3090.15'
	4/15/85			17.83'		3087.90'
	5/1/85			17.83'		3087.90'
	5/3/85			17.67'		3088.06'
	5/24/85			17.48'		3088.25'
	6/19/85			16.00'		3089.73'
	11/22/85			15.00'		3090.73'
	7/28/86			16.04'		3089.69'
	11/17/86			15.96'		3089.77'
N-17A	11/24/80	3098.41'		14.31'		3084.10'
	7/27/83			12.66'		3085.75'
	8/2/83			12.66'		3085.75'
	8/8/83			12.99'		3085.42'
	8/30/83			13.07'		3085.34'
	10/13/83			13.57'		3084.84'
	2/7/84			15.16'		3083.25'
	3/6/84			14.16'		3084.25'
	4/12/84			15.49'		3082.92'
	5/3/84			15.91'		3082.50'
	5/21/84			13.74'		3084.67'
	5/30/84			12.99'		3085.42'
	* 6/30/84			11.66'		3086.75'
	8/10/84			12.08'		3086.33'
	9/18/84			13.66'		3084.75'

Table 15-1. GROUND WATER ELEVATION DATA

Well	Date	TOC[1]	-	FTOC	=	Ground Water Elevation
East Landtreatment Unit						
N-17A (cont.)	11/13/84			13.83'		3084.58'
	11/15/84			14.50'		3083.91'
	4/25/85			16.17'		3082.24'
	5/1/85			15.75'		3082.66'
	5/3/85			15.25'		3083.16'
	5/24/85			13.33'		3085.08'
	6/19/85			12.29'		3086.12'
	11/20/85			14.29'		3084.12'
	7/23/86			13.25'		3085.16'
	11/17/86			14.83'		3083.58'
South Land Treatment Unit						
N-9A	2/18/82	3113.50'		18.17'		3095.33'
	5/14/82			19.33'		3094.16'
	8/19/82			16.33'		3097.16'
	11/5/82			17.00'		3096.50'
	4/25/83			20.08'		3093.42'
N-9AR	9/21/83	3115.69'		16.40'		3099.29'
	10/14/83			20.33'		3095.36'
	11/28/83			20.93'		3094.77'
	5/23/84			22.13'		3093.56'
	★ 7/10/84			20.47'		3095.22'
	9/18/84			19.97'		3095.72'
	11/15/84			21.36'		3094.36'
	5/3/85			22.92'		3092.77'
	6/20/85			22.12'		3093.57'
	8/6/85			21.33'		3094.36'
	11/22/85			21.17'		3094.52'
	7/29/86			21.67'		3094.02'
	11/19/86			21.42'		3094.27'
N-9	2/19/82	3112.75'		17.16'		3095.58'
	5/14/82			18.42'		3094.33'
	8/19/82			16.33'		3096.42'
	11/5/82			16.16'		3096.58'
	4/25/83			19.08'		3093.67'
N-9R	9/21/83	3115.07'		15.10'		3099.97'
	10/14/83			19.25'		3095.82'
	11/23/83			19.71'		3095.36'
	5/23/84			21.17'		3093.90'
	★ 7/10/84			19.92'		3095.15'
	9/18/84			19.17'		3095.90'
	11/15/84			20.33'		3094.74'

Table 15-1. GROUND WATER ELEVATION DATA

Well	Date	TOC[1] -	FTOC =	Ground Water Elevation
East Landtreatment Unit				
N-9R (cont.)	5/3/85		22.17’	3092.90’
	6/20/85		20.79’	3094.28’
	8/6/85		20.17’	3094.90’
	8/28/85		19.83’	3095.24’
	11/22/85		20.17’	3094.90’
	7/29/86		20.46’	3094.61’
	8/28/86		20.08’	3094.99’
	11/19/86		20.17’	3094.90’
ERM-6	2/19/82	3117.25’	20.92’	3096.33’
	5/14/82		22.16’	3095.08’
	8/19/82		20.08’	3097.16’
	11/3/82		20.00’	3097.25’
	4/25/82		22.08’	3095.16’
ERM-6R	9/21/83	3116.23’	15.50’	3100.73’
	11/28/83		18.71’	3097.52’
	5/23/84		20.50’	3095.73’
	★ 7/11/84		19.08’	3097.15’
	9/18/84		17.83’	3098.40’
	11/15/84		19.00’	3097.23’
	5/3/85		21.08’	3095.15’
	6/20/85		20.00’	3096.23’
	11/22/85		19.00’	3097.23’
	1/7/86		19.75’	3096.48’
	7/29/86		19.43’	3096.79’
	11/19/86		19.33’	3096.90’
N-7A	2/19/82	3126.92’	20.92’	3100.00’
	5/14/82		23.25’	3103.67’
	8/19/82		19.58’	3107.33’
	11/3/82		19.00’	3107.92’
	4/25/83		23.67’	3103.25’
	4/26/83		23.67’	3103.29’
	10/13/83		18.17’	3108.79’
	5/23/84		23.42’	3103.54’
	★ 7/10/84		20.08’	3106.88’
	9/18/84		18.02’	3109.54’
	11/15/84		19.33’	3107.63’
	5/3/85		23.92’	3103.04’
	6/20/85		21.92’	3105.04’
	11/22/85		19.75’	3107.21’
	1/7/86		21.25’	3105.71’
	7/30/86		20.46’	3106.50’
	11/18/86		20.29’	3106.73’

ATTACHMENT IV.6.

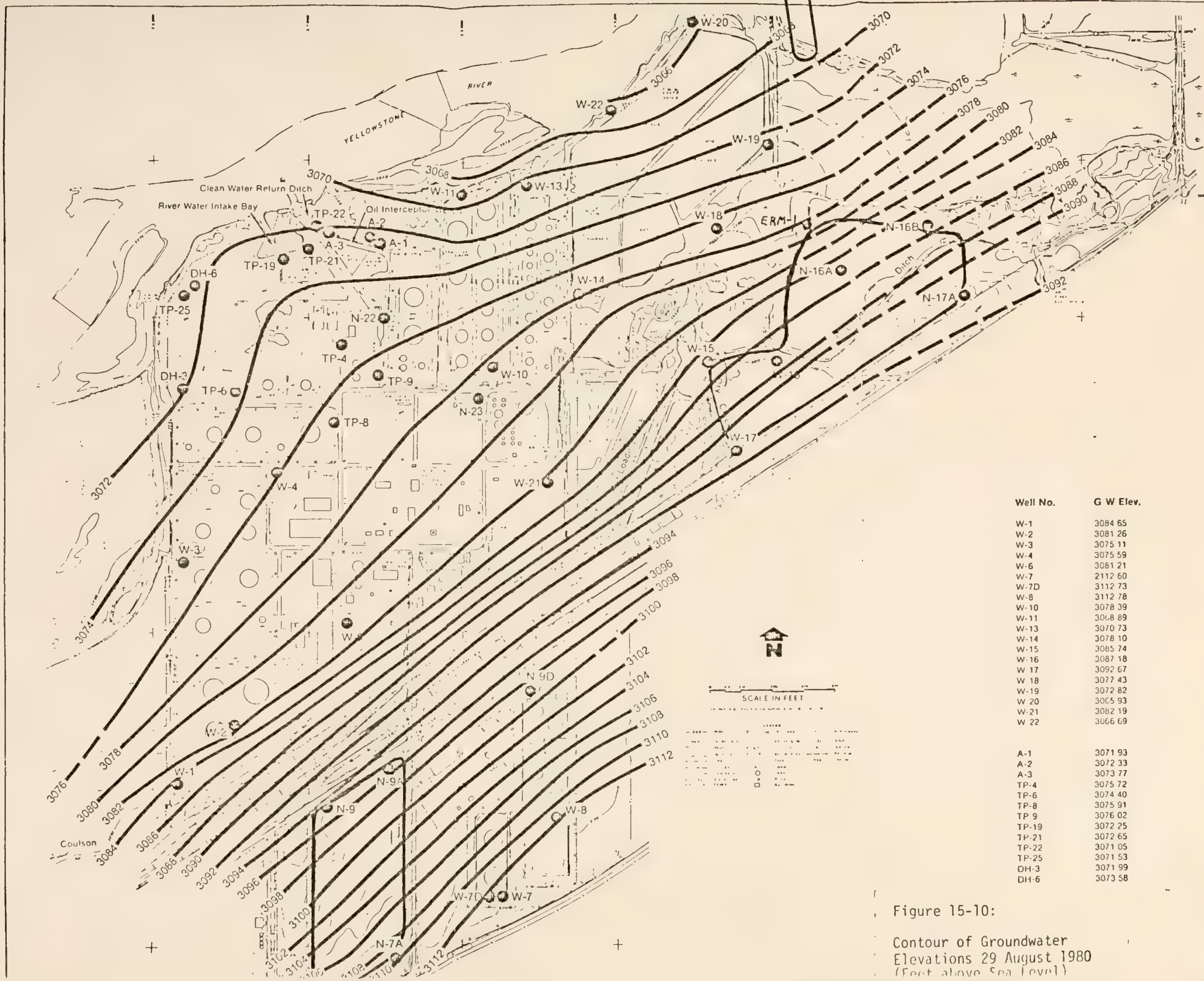
15.4.6 Aquifer Flow Rates and Direction

The ground water flow rate and direction will be estimated, based upon previous data and updated annually. The rate and extent of migration of hazardous constituents will be assessed depending on the results obtained from evaluating the above data. If hazardous constituents are shown to be present in downgradient monitoring wells, their flow rate will be computed using the Darcy-based equation for migration as follows:

$$V = PI/n,$$

where:
V = groundwater velocity in ft/day,
P = hydraulic conductivity in ft/day,
I = groundwater hydraulic gradient in ft/ft,
n = porosity.

The hydraulic gradient ("I" value) will be estimated at the time of the groundwater assessment by calculating the difference between "high" and "low" groundwater elevations for the appropriate HWMA (up and downgradient wells) and dividing by the distance between those elevations, perpendicular to the groundwater flow. Permeability "P" values will be based on 1980 well pumping tests in the aquifers near the land treatment boundaries (Weston, 1981) as well as information provided in Appendix 15.VII. Pumping tests for well W-8 were used for the alluvial aquifer underlying the South Land Treatment Area. Pumping tests for well W-18 were used for the alluvial aquifer underlying the East Land Treatment Area. Direction of flow shall be assessed by mapping groundwater elevation data from groundwater assessment monitoring. The mapping will be similar to Figures 15-10 and 15-11 but only RCRA-monitored wells will be used. Porosity will be estimated, based on knowledge of the type of aquifer composition, or by measurement if necessary.



Well No.	G W Elev.
W-1	3084 65
W-2	3081 26
W-3	3075 11
W-4	3075 59
W-6	3081 21
W-7	2112 60
W-7D	3112 73
W-8	3112 78
W-10	3078 39
W-11	3068 89
W-13	3070 73
W-14	3078 10
W-15	3085 74
W-16	3087 18
W 17	3092 67
W 18	3077 43
W-19	3072 82
W 20	3065 93
W-21	3082 19
W 22	3066 69
A-1	3071 93
A-2	3072 33
A-3	3073 77
TP-4	3075 72
TP-6	3074 40
TP-8	3075 91
TP 9	3076 02
TP-19	3072 25
TP-21	3072 65
TP-22	3071 05
TP-25	3071 53
DH-3	3071 99
DH-6	3073 58

Figure 15-10:

Contour of Groundwater Elevations 29 August 1980 (Feet above Sea Level)

ATTACHMENT IV.7.

CHAPTER THREE

MONITORING WELL DESIGN AND CONSTRUCTION

The purpose of this chapter is to examine important aspects of RCRA monitoring well design and construction. Included in this chapter are discussions on the following topics:

- Drilling methods for installing wells (Section 3.1);
- Monitoring well construction materials (Section 3.2);
- Design of well intakes (Section 3.3);
- Development of wells (Section 3.4);
- documentation of well construction activity (Section 3.5);
- Specialized well design (Section 3.6); and
- Replacement of existing wells (Section 3.7).

In order to better understand proper ground-water monitoring procedure, a differentiation between monitoring wells and piezometer wells should be made. Monitoring wells provide for the measurement of total well depth, the collection of representative ground-water samples, the detection of light- and dense-phase organics, and, under certain circumstances, the collection of samples of light- and dense-phase organics. Piezometer wells are used to determine static water level, in addition to establishing horizontal and vertical ground-water flow directions.

3.1 Drilling Methods

A variety of well-drilling methods can be used in the installation of ground-water monitoring wells. It is important that the drilling method or methods used minimize disturbance of subsurface materials and not contaminate the subsurface and ground water (40 CFR 265.91(c)). Table 3-1 lists the drilling methods that are most commonly used to install wells. The selection of the actual drilling method is, of course,

TABLE 3-1

DRILLING METHODS FOR VARIOUS TYPES OF GEOLOGIC SETTINGS

Geologic Environment	Drilling Methods				
	Air** Rotary	Water/Mud Rotary	Cable Tool	Hollow-Stem Continuous Auger	Solid-Stem Continuous Auger*
Glaciated or unconsolidated materials less than 150 feet deep	●	●	●	●	●
Glaciated or unconsolidated materials more than 150 feet deep	●	●	●		
Consolidated rock formations less than 500 feet deep (minimal or no fractured formations)	●	●	●		
Consolidated rock formations less than 500 feet deep (highly fractured formations)	●	●	●		
Consolidated rock formations more than 500 feet deep (minimal formations)	●	●	●		
Consolidated rock formations more than 500 feet deep (highly fractured formations)	●	●	●		

* Above potentiometric surface.

** Includes conventional and wireline core drilling.

NOTE:

Although several methods are suggested as appropriate for similar conditions, one method may be more suitable than the others.

a function of site-specific geologic conditions. Table 3-1 provides an interpretation of how geologic conditions may influence the choice of drilling method. The following sections discuss each drilling method and its applicability to the installation of RCRA monitoring wells. It is important to note that regardless of the drilling method selected, the owner/operator is responsible for the drilling equipment and for having it decontaminated. This procedure should be followed before use and between borehole locations to prevent cross contamination of wells where contamination has been detected or is suspected from the site characterization work that precedes the well installation work. In addition to selecting the proper drilling techniques, other precautions to prevent distribution of any existing contaminants throughout a borehole should be taken.

3.1.1 Hollow-Stem Continuous-Flight Auger

The hollow-stem continuous-flight auger is among the most frequently employed tools used in drilling monitoring wells in unconsolidated materials. The drill rigs used for this drilling method are usually mobile, fast, and relatively inexpensive to operate. Drilling fluids normally are not used, and disturbance to the aquifers of concern is minimal. Auger drilling is usually limited to unconsolidated materials and to depths of approximately 150 feet. In formations where the borehole will not stand open, the well is constructed inside the hollow-stem auger prior to the auger's removal from the ground. Hollow-stem augers with inside diameters of six inches or six and one-quarter inches are readily available for this purpose. Generally, the diameter of the well that can be constructed with this type of drill rig is limited to four inches or less, although firms now manufacture eight and one-quarter inch inside diameter hollow-stem augers and are experimenting with ten and one-quarter inch inside diameter hollow-stem augers. The differential between the inner diameter of the auger and the outer diameter of the well casing should ideally be at least three to five inches to permit effective placement of filter pack and annular sealant.

The use of hollow-stem auger drilling in heaving sand environments also presents some difficulties. However, with care and the use of proper drilling procedures, this difficulty can be overcome. For example, a positive pressure head within the auger stem can be developed by filling the auger with clean water. The heaving sands are thus displaced when a knock-out plug (which is part of the auger) is removed. If casing is driven, the added outer diameter of the drive shoe must be considered in the calculation of sealant and filter pack volume.

3.1.2 Solid-Stem Continuous-Flight Auger

The use of solid-stem continuous-flight auger drilling techniques for monitoring well construction is limited to fine-grained unconsolidated materials that will maintain an open borehole or in consolidated sediments. The method is similar to the hollow-stem continuous-flight augers except that the augers must be removed from the ground to allow insertion of the well casing and screen. This method is also limited to a depth of approximately 150 feet. In areas characterized by less competent sediments or soils (i.e., unstable, unable to retain the sphericity of the borehole during drilling operations), solid-stem auger drilling can be utilized to limited depths. Caving of the borehole, however, is an imposing problem. Another limitation of the solid-stem auger is its use below the potentiometric surface. Maintaining the integrity of the borehole in the saturated zone is also difficult at times, especially in poorly consolidated sediments. Solid-stem auger drilling is not used for in-place well construction, whereas hollow-stem auger drilling is. Collection of soil or formation samples is impractical, and therefore, accurate depiction of site stratigraphy is difficult. Solid-stem augers have very limited utility in the boring program for site characterization.

3.1.3 Cable Tool

Cable tool drilling is relatively slow but offers many advantages for monitoring well construction in relatively shallow consolidated formations and unconsolidated formations. The method allows for the

collection of excellent formation samples and detection of even relatively fine-grained permeable zones. The installation of a steel casing as drilling progresses also provides an excellent temporary host for the construction of a monitoring well once the desired depth is reached.

Small amounts of water must be added to the hole as drilling progresses until the potentiometric surface is encountered. The owner/operator should only use water that cannot itself contaminate formation water. A minimum six-inch diameter drive pipe should be used to facilitate the placement of the well casing, screen, and gravel pack, and a minimum five-foot long seal should be made prior to beginning the removal of the drive pipe. The drive pipe should be pulled while the sealant is still fluid and capable of flowing outward to fill the annular space vacated by the drive pipe and shoe. The drive pipe also should be pulled in sections and additional sealant added to ensure that a satisfactory seal is obtained. Cable tool rigs have generally been replaced by rotary rigs for water well construction in most areas of the United States. Therefore, cable tool rigs may not be readily available in many regions.

3.1.4 Air Rotary

Rotary drilling involves the use of circulating fluids, i.e., mud, water, or air, to remove the drill cuttings and maintain an open hole as drilling progresses. The different types of rotary drilling methods are named according to the type of fluid and the direction of fluid flow. Air rotary drilling forces air down the drill pipe and back up the bore hole to remove the drill cuttings. The use of air rotary drilling techniques is best suited for use in hard-rock formations. In soft unconsolidated formations, casing is driven to keep the formations from caving.

Air rotary drilling can be used without affecting the quality of ground water from monitoring wells in hard rock formations with minimum unconsolidated overburden. The successful construction of monitoring

wells using this drilling technique hinges on the bore hole remaining open after the air circulation ceases. It is an inappropriate method in areas where the upper soil horizons are contaminated and sloughing of sidewalls would likely result in contamination of the well. The air from the compressor on the rig should be filtered to ensure that oil from the compressor is not introduced into the ground-water system to be monitored. Foam or joint compounds for the drill rods should not be used with air rotary drilling because of the potential for introduction of contaminants into the hydrogeologic environment. Caution should be taken in using air rotary drilling techniques in highly polluted or hazardous environments. Contaminated solids and water that are blown out of the hole are difficult to contain and may adversely affect the drill crew and observers. When air rotary is used, shrouds, canopies, bluooey lines, or directional pipes should be used to contain and direct the drill cuttings away from the drill crew. Any contaminated materials (soil and/or water) should be collected and disposed of in an approved waste disposal facility. On the other hand, air rotary drilling techniques have actually improved safety conditions.

3.1.5 Water Rotary

Water rotary drilling involves the introduction of water into the borehole through the drill pipe and subsequent circulation of water back up the hole to remove drill cuttings. Great care must be taken to ensure that water used in the drilling process does not contain contaminants. If the driller uses water rotary drilling to install wells, drilling water should be analyzed to ensure that it is contaminant-free. Generally, except when core drilling in hard rock units, the water becomes muddy after a few circulations.

There are problems associated with the use of water rotary drilling. The recognition of water-bearing zones is hampered by the addition of water into the system. Also, in poorly consolidated sediments, the

drillers may have a problem with caving of the borehole prior to installation of the screen and casing. In highly fractured terrains, it may also be hard to maintain water circulation.

3.1.6 Mud Rotary

Mud rotary drilling techniques involve the use of various types of drilling muds as the fluid that is introduced into the borehole. The mud circulates back up the hole during drilling, carrying away drill cuttings in the same manner as the air and water rotary drilling methods. Muds provide the additional benefit of stabilizing the hole.

There are several types of muds available at present, primarily bentonite, barium sulfate, organic polymers, cellulose polymers, and polyacrylamides. The owner/operator should provide any chemical data regarding potential impacts on water quality. While there are hydrogeologic conditions under which mud rotary drilling is the best option, the technical reviewer should make certain that the mud(s) utilized do not affect the chemistry of ground-water samples, samples from the borehole, or the operation of the well. The latter may adversely affect the assessment of aquifer characteristics, for example:

- Bentonite muds reduce the effective perosity of the formation around the well, thereby compromising estimates of well recovery. Bentonite may also affect local ground-water pH. Additives to modulate viscosity and density may also introduce contaminants to the system or force large, irrecoverable quantities of mud into the formation.

- Some organic polymers and compounds provide an environment for bacterial growth which, in turn, reduces the reliability of sampling results.

3.2 Monitoring Well Construction Materials

The technical reviewer must ensure that the owner/operator used well construction materials that are durable enough to resist chemical and physical degradation and do not interfere with the quality of ground-water samples. Specific well components that are of concern include well

casings, well screens, filter packs, and annular seals or backfills. Figure 3-1 is a drawing of a typical ground-water monitoring well. The following sections describe various acceptable materials the owner/operator should have used in constructing the well as depicted in Figure 3-1.

3.2.1 Well Casings and Well Screen

A variety of construction materials have been used for the casings and well screens, including virgin fluorocarbon resins (i.e., fluorinated ethylene propylene (FEP), polytetrafluoroethylene (PTFE), Teflon®), stainless steel (304, 316, or 2205), cast iron, galvanized steel, polyvinyl chloride (PVC), polyethylene, epoxy biphenol, and polypropylene. Many of these materials, however, may affect the quality of ground-water samples and may not have the long-term structural characteristics required of RCRA monitoring wells. For example, steel casing deteriorates in corrosive environments; PVC deteriorates when in contact with ketones, esters, and aromatic hydrocarbons; polyethylene deteriorates in contact with aromatic and halogenated hydrocarbons; and polypropylene deteriorates in contact with oxidizing acids, aliphatic hydrocarbons, and aromatic hydrocarbons. In addition, steel, PVC, polyethylene, and polypropylene may adsorb and leach constituents that may affect the quality of ground-water samples.

The selection of well casing and screen materials should have been made with due consideration to geochemistry, anticipated lifetime of the monitoring program, well depth, chemical parameters to be monitored and other site-specific factors. Fluorocarbon resins or stainless steel should be specified for use in the saturated zone when volatile organics are to be determined, or may be tested, during a 30-year period. In such cases, and where high corrosion potential exists or is anticipated, fluorocarbon resins are preferable to stainless steel. An example of a stainless steel monitoring well is provided in Figure 3-2. National Sanitation Foundation (NSF) or ASTM-approved polyvinylchloride (PVC) well casing and screens may be appropriate if only trace metals or nonvolatile

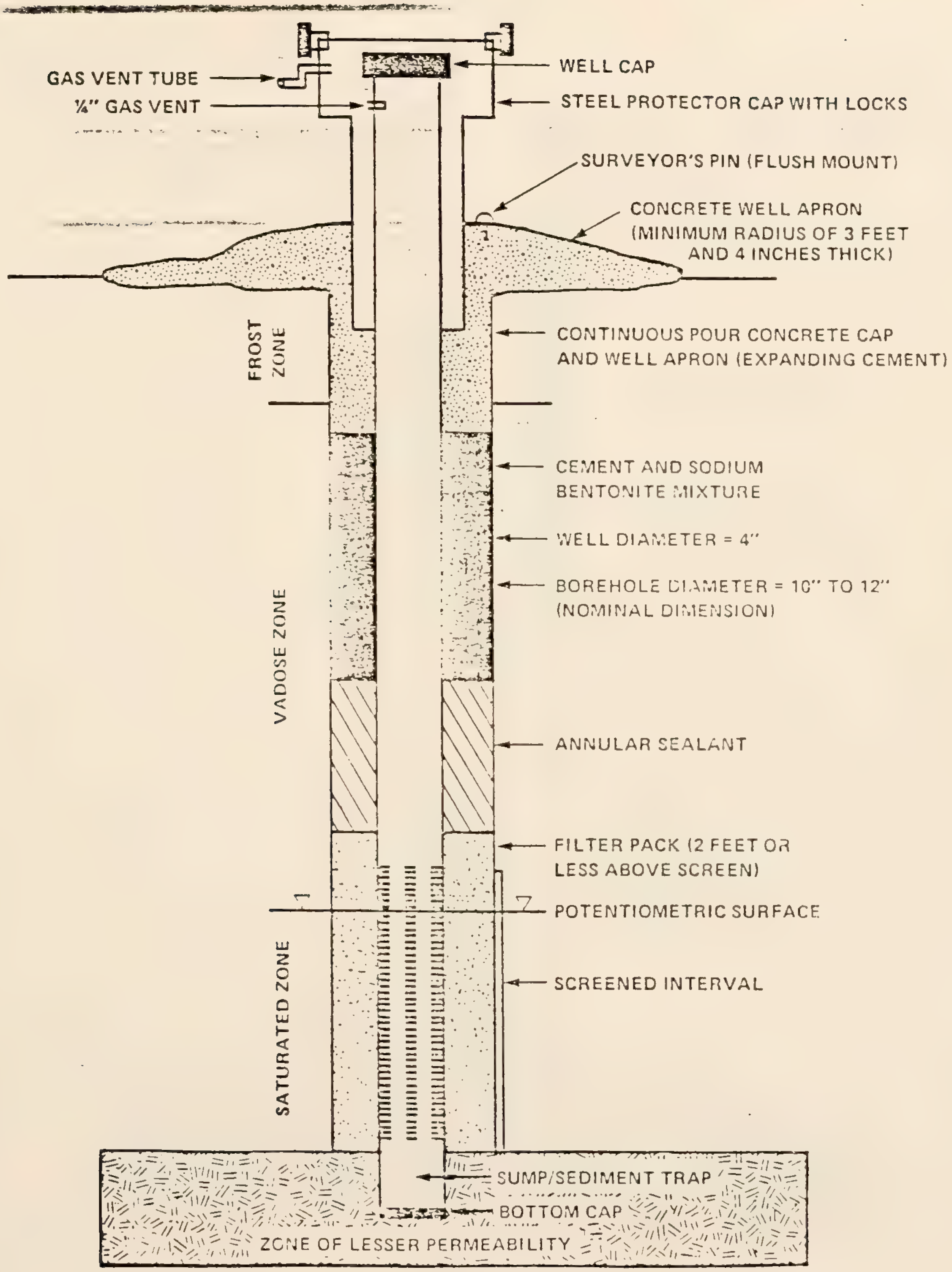

GAS VENT TUBE
¼" GAS VENT
WELL CAP
STEEL PROTECTOR CAP WITH LOCKS
SURVEYOR'S PIN (FLUSH MOUNT)
CONCRETE WELL APRON (MINIMUM RADIUS OF 3 FEET AND 4 INCHES THICK)
FROST ZONE
CONTINUOUS POUR CONCRETE CAP AND WELL APRON (EXPANDING CEMENT)
CEMENT AND SODIUM BENTONITE MIXTURE
WELL DIAMETER = 4"
BOREHOLE DIAMETER = 10" TO 12" (NOMINAL DIMENSION)
VADOSE ZONE
ANNULAR SEALANT
FILTER PACK (2 FEET OR LESS ABOVE SCREEN)
POTENTIOMETRIC SURFACE
SATURATED ZONE
SCREENED INTERVAL
SUMP/SEDIMENT TRAP
BOTTOM CAP
ZONE OF LESSER PERMEABILITY

FIGURE 3-1. GENERAL MONITORING WELL – CROSS SECTION

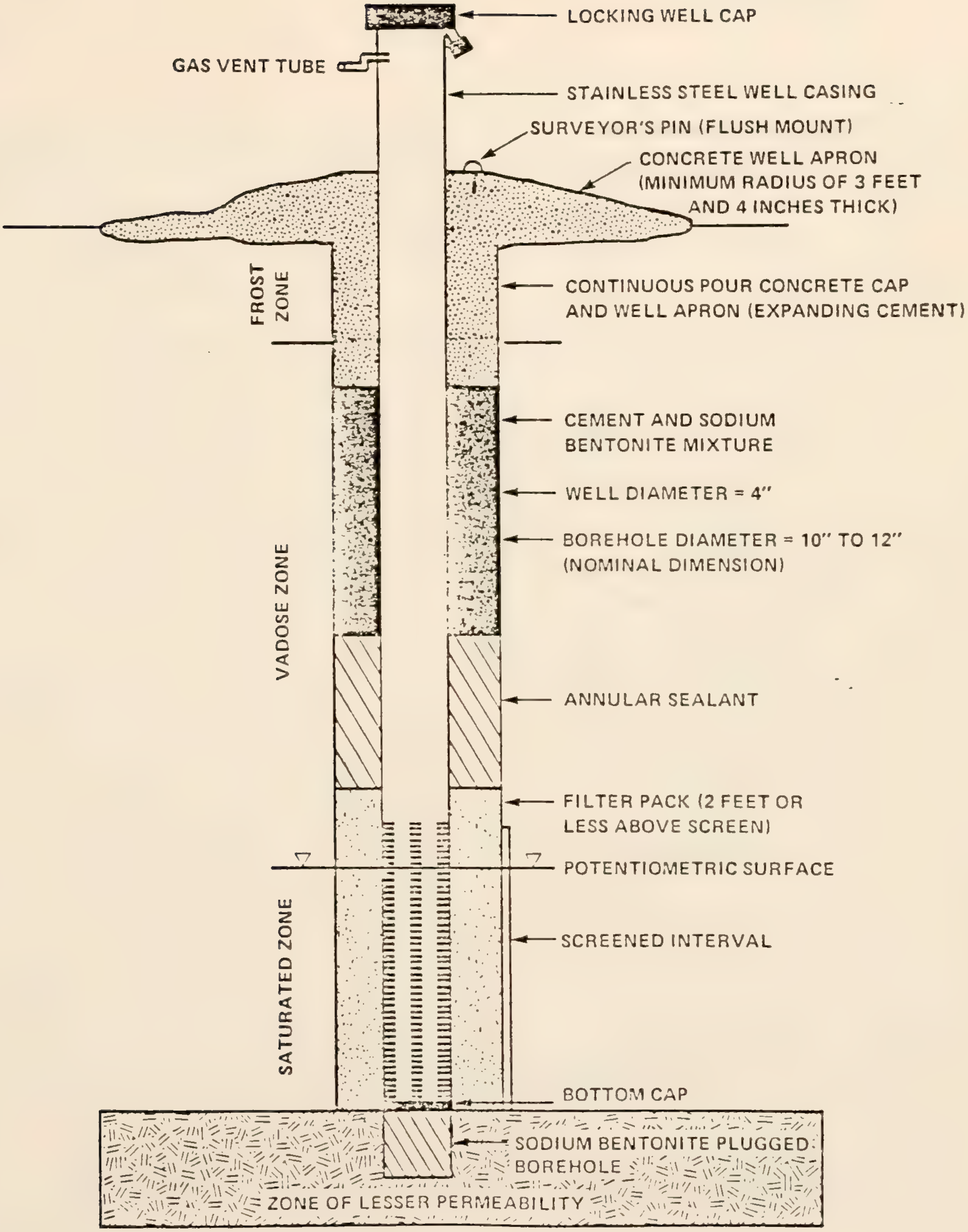

LOCKING WELL CAP
GAS VENT TUBE
STAINLESS STEEL WELL CASING
SURVEYOR'S PIN (FLUSH MOUNT)
CONCRETE WELL APRON (MINIMUM RADIUS OF 3 FEET AND 4 INCHES THICK)
FROST ZONE
CONTINUOUS POUR CONCRETE CAP AND WELL APRON (EXPANDING CEMENT)
CEMENT AND SODIUM BENTONITE MIXTURE
WELL DIAMETER = 4"
BOREHOLE DIAMETER = 10" TO 12" (NOMINAL DIMENSION)
VADOSE ZONE
ANNULAR SEALANT
FILTER PACK (2 FEET OR LESS ABOVE SCREEN)
POTENTIOMETRIC SURFACE
SATURATED ZONE
SCREENED INTERVAL
BOTTOM CAP
SODIUM BENTONITE PLUGGED BOREHOLE
ZONE OF LESSER PERMEABILITY

FIGURE 3-2 GENERAL STAINLESS STEEL MONITORING WELL – CROSS SECTION

organics are the contaminants anticipated. As research demonstrates the appropriateness of other materials for screens or casing in the saturated or vadose zones, they may be utilized on a site-specific basis. Stainless steel, fluorocarbon resins, or PVC are appropriate casing materials in the unsaturated zone.

Figure 3-3 illustrates the concept of a composite well. Many combinations of materials may be employed in a manner consistent with this guidance. One combination that should be avoided is the use of dissimilar metals, such as stainless steel and galvanized steel, without an electrically isolating (dielectric) bushing. If such dissimilar metals are in direct contact in the soil, a potential difference is created and leads to accelerated corrosion of the galvanized steel (in this example). More generically, in the Galvanic series the less noble metal becomes the anode to the more noble metal and is corroded at an accelerated rate. In well construction, this acceleration in corrosion at the point of connection will lead to failure of the construction materials and loss of a RCRA monitoring well. Theoretically, a potential difference is created in one type of metal penetrating heterogeneous strata, but the difference in potentials would not be as great. In conclusion, a dielectric coupling should be used for connecting dissimilar metals in either the saturated or vadose zone.

There are two reasons why owners/operators should have selected appropriate well screen and casing materials:

- Long term structural integrity, i.e., 30 or more years, is essential to the collection of unbiased ground-water samples over the active life of the facility and post-closure period.

- Owner/operators of facilities whose Part B or post-closure permit application has been called are required under 270.14(c)(4) to analyze any plume(s) for Appendix VIII constituents (see the RCRA Ground-Water Monitoring Compliance Order Guide, August 1985). The remainder of facilities must monitor for Appendix VII constituents. Well construction materials should not bias the collection and analysis of low concentrations of hazardous constituents by reacting with the ground-water samples.

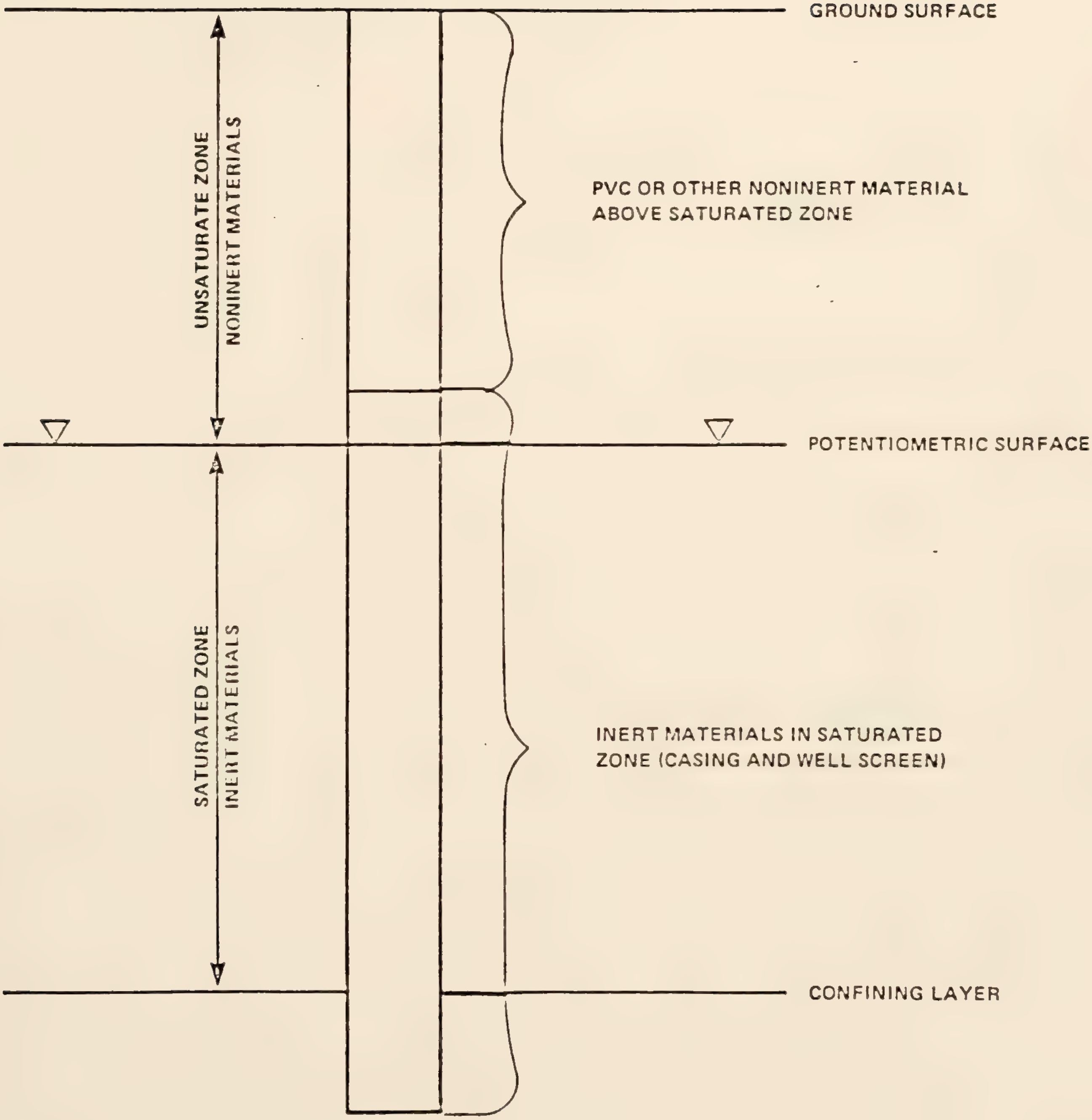


FIGURE 3-3. COMPOSITE WELL CONSTRUCTION
(INERT CONSTRUCTION MATERIALS IN SATURATED ZONE)

Plastic pipe sections must be flush threaded or have the ability to be connected by another mechanical method that does not introduce contaminants such as glue or solvents into the well. Also, monitoring wells must be structurally sound in order to withstand vigorous well development procedures. Well casings and screens should be steam cleaned prior to emplacement to ensure that all oils, greases, and waxes have been removed. Because of the softness of casings and screens made of fluorocarbon resins, these materials should be detergent-washed, not steam-cleaned, prior to installation.

The owner/operator should normally use well casing with either a two-inch or four-inch inside diameter. Larger casing diameters, however, may be necessary where dedicated purging or sampling equipment is used or where the well is screened in a deep formation.

The installation of a sump (sampling cup device) at the bottom of a monitoring well (Figure 3-1) is recommended. The sump will aid in collecting fine-grain sediments and result in prolonging the operating life of the screen. An extra benefit of using a sump is its ability to capture intermittent dense-phase contaminants for analysis. In zones composed of fine-grained material (clays and silts) where turbidity may be problematic, the decision flow chart (Figure 3-4) for turbid ground-water samples should be consulted to evaluate well construction and development.

3.2.2 Monitoring Well Filter Pack and Annular Sealant

The materials used to construct the filter pack should be chemically inert (e.g., clean quartz sand, silica, or glass beads), well rounded, and dimensionally stable (see Section 3.3 for more detail on well intake design). Fabric filters should not be used as filter pack materials. Natural gravel packs are acceptable, provided that the owner/operator conducts a sieve analysis to establish the appropriate well screen slot size and determine chemical inertness of the filter pack materials in anticipated environments.

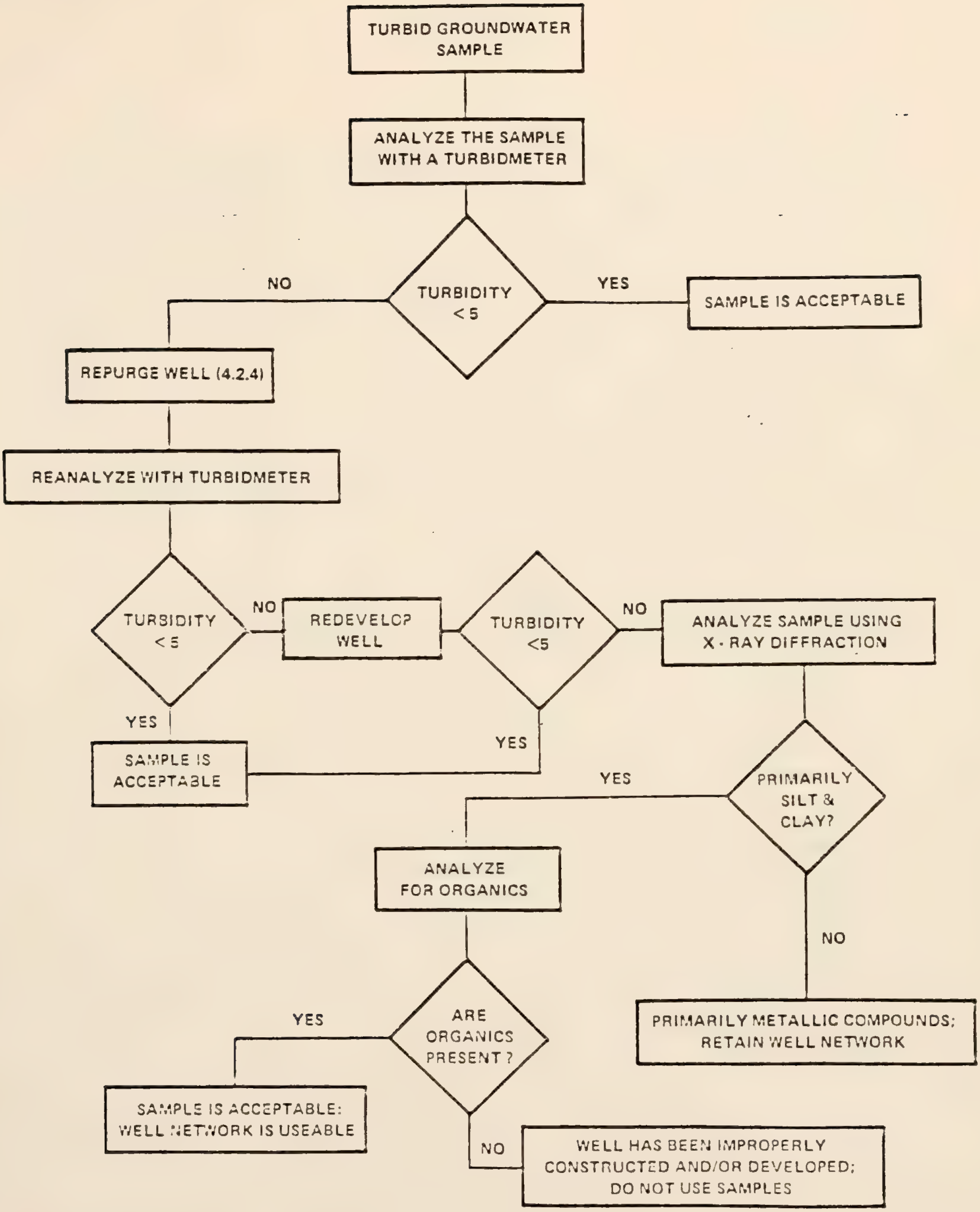

TURBID GROUNDWATER SAMPLE
ANALYZE THE SAMPLE WITH A TURBIDMETER
TURBIDITY < 5
NO
YES
SAMPLE IS ACCEPTABLE
REPURGE WELL (4.2.4)
REANALYZE WITH TURBIDMETER
TURBIDITY < 5
NO
REDEVELOP WELL
TURBIDITY <5
NO
ANALYZE SAMPLE USING X - RAY DIFFRACTION
YES
SAMPLE IS ACCEPTABLE
YES
YES
PRIMARILY SILT & CLAY?
ANALYZE FOR ORGANICS
NO
ARE ORGANICS PRESENT ?
YES
PRIMARILY METALLIC COMPOUNDS; RETAIN WELL NETWORK
SAMPLE IS ACCEPTABLE: WELL NETWORK IS USEABLE
NO
WELL HAS BEEN IMPROPERLY CONSTRUCTED AND/OR DEVELOPED; DO NOT USE SAMPLES

FIGURE 3-4 DECISION CHART FOR TURBID GROUND-WATER SAMPLES

The materials used to seal the annular space must prevent the migration of contaminants to the sampling zone from the surface or intermediate zones and prevent cross contamination between strata. The materials should be chemically compatible with the anticipated waste to ensure seal integrity during the life of the monitoring well and chemically inert so they do not affect the quality of the ground-water samples. The permeability of the sealants should be one to two orders of magnitude less than the surrounding formation. Figure 3-1 illustrates an appropriate distribution of annular sealants. An example of an appropriate use of annular sealant material is using a minimum of two feet of certified sodium bentonite pellets immediately over the filter pack when in a saturated zone. The pellets are most appropriate in a saturated zone because they will penetrate the column of water to create an effective seal. Coarse grit sodium bentonite is likely to hydrate and bridge before reaching the filter pack. A cement and bentonite mixture, bentonite chips, or antishrink cement mixtures should be used as the annular sealant in the unsaturated zone above the certified-bentonite pellet seal and below the frost line. Again, the appropriate clay must be selected on the basis of the environment in which it is to be used. In most cases, sodium bentonite is appropriate. The addition of bentonite to the cement admixture should generally be in the amount of 2 to 5 percent by weight of cement content. This will aid in reducing shrinkage and control time of setting. Calcium bentonite may be more appropriate in calcic sediments/soils due to reduced cation exchange potential. Clays should be pure, i.e., free of additives that may affect ground-water quality. From below the frost line, the cap should be composed of concrete blending into a four-inch thick apron extending three feet or more from the outer edge of the borehole.

The untreated sodium bentonite seal should be placed around the casing either by dropping it directly down the borehole or, if a hollow-stem auger is used, putting the bentonite between the casing and the inside of the auger stem. Both of these methods present a potential for

bridging. In shallow monitoring wells, a tamping device should be used to reduce this potential. In deeper wells, it may be necessary to pour a small amount of formation water down the casing to wash the bentonite down the hole. In either case, a spacing differential of 3 to 5 inches should exist between the outer diameter of the casing and the inner diameter of the auger or the surface of the borehole to facilitate emplacement of filter pack and annular sealants. Moreover, the precise volume of filter pack and sealant required should be calculated to establish their correct subsurface distribution. The actual volume of materials used should be determined during well construction. Discrepancies between calculated volumes and volumes used require explanation.

The cement-bentonite mixture should be prepared using clean water and placed in the borehole using a tremie pipe. The tremie method ensures good sealing of the borehole from the bottom.

The remaining annular space should be sealed with expanding cement to provide for security and an adequate surface seals. Locating the interface between the cement and bentonite-cement mixture below the frost line serves to protect the well from damage due to frost heaving. The cement should be placed in the borehole using the tremie method.

Upon completion of the well, installation of a suitable threaded or flanged cap or compression seal should be placed or locked in properly to prevent either tampering with the well or the entrance of foreign material into it (Figure 3-2). A one-quarter inch vent hole pipe provides an avenue for the escape of gas. Placement of concrete or steel bumper guards around the well will prevent external damage by a vehicular collision with the exposed casing.

3.3 Well Intake Design

The owner/operator should have designed and constructed the intake of the monitoring wells to (1) allow sufficient ground-water flow to the well for sampling; (2) minimize the passage of formation materials

(turbidity) into the well; and (3) ensure sufficient structural integrity to prevent the collapse of the intake structure.

For wells completed in unconsolidated materials, the intake of a monitoring well should consist of a screen or slotted casing with openings sized to ensure that formational material is prohibited from passing through the well during development. Extraneous fine-grained material (clays and silts) that has been dislodged during drilling may be left on the screen and the water in the well. These fines should be removed from the screen and filter pack during development of the well. The owner/operator should use commercially manufactured screens or slotted casings. Field slotting of screens should not be allowed.

The annular space between the face of the formation and the screen or slotted casing should be filled to minimize passage of formation materials into the well. The driller should therefore install a filter pack in each monitoring well that is constructed on site. Furthermore, in order to ensure discrete sample horizons, the filter pack should extend no more than two feet above the well screen as illustrated in Figure 3-1.

3.4 Well Development

After the owner/operator completed constructing monitoring wells, natural hydraulic conductivity of the formation should have been restored and all foreign sediment removed to ensure turbid-free ground-water samples.

A variety of techniques are available for developing a well. To be effective, they require reversals or surges in flow to avoid bridging by particles, which is common when flow is continuous in one direction. These reversals or surges can be created by using surge blocks, bailers, or pumps. Formation water should be used for surging the well. In low-yielding water-bearing formations, an outside source of water may sometimes be introduced into the well to facilitate development. In

these cases, this water should be chemically analyzed to evaluate its potential impact on in-situ water quality. The driller should not have used air to develop the wells. All developing equipment should have been decontaminated prior to use as should have the materials of construction.

The owner/operator should have developed wells to be clay- and silt-free. If, after development of the well is complete, it continues to yield turbid ground-water samples, the owner/operator should follow the procedure described in Figure 3-4. The recommended acceptance/ rejection value of five nephelometric turbidity units (N.T.U.) is based on the need to minimize biochemical activity and possible interference with ground-water sample quality. The same criteria applies to turbidity measurements expressed in other units such as the formazin turbidity unit (F.T.U.) or Jackson turbidity unit (J.T.U.).

One should determine the relative hydraulic conductivity of different layers within the aquifer in which the screen is placed (the transmissivity/pumping test method is recommended). Using this information along with pH, temperature measurements and mean seasonal flow rates, one should evaluate the initial performance of the well and use these values for periodic redevelopment and maintenance assessments.

3.5 Documentation of Well Design and Construction

In the context of a compliance order, the technical reviewer should require the owner/operator to compile information on the design and construction of wells. Such information may include:

- Date/time of construction
- Drilling method and drilling fluid used
- Well location (± 0.5 ft.)
- Bore hole diameter and well casing diameter
- Well depth (± 0.1 ft.)
- Drilling and lithologic logs
- Casing materials

- Screen materials and design
- Casing and screen joint type
- Screen slot size/length
- Filter pack material/size, grain analysis (D10)
- Filter pack volume calculations
- Filter pack placement method
- Sealant materials (percent bentonite)
- Sealant volume (lbs/gallon of cement)
- Sealant placement method
- Surface seal design/construction
- Well development procedure
- Type of protective well cap
- Ground surface elevation (± 0.01 ft.)
- Surveyor's pin elevation (± 0.01 ft.) on concrete apron
- Top of monitoring well casing elevation (± 0.01 ft.)
- Top of protective steel casing elevation (± 0.01 ft.)
- Detailed drawing of well (include dimensions)

3.6 Specialized Well Designs

There are two cases where owners/operators should use special monitoring well designs:

- Where the owner/operator has chosen to use dedicated pumps to draw ground-water samples; and
- Where light and/or dense-phase immiscibles may be present.

If the owner/operator elected to use a dedicated system, it should be a fluorocarbon resin or stainless steel bailer, or a dedicated positive gas displacement bladder pump composed of the same two materials. As other sampling devices that can perform at least equivalently become available, they may be employed as well.

The introduction of this pump, however, necessitates certain changes in the well cross section depicted in Figure 3-1. Figure 3-5 represents

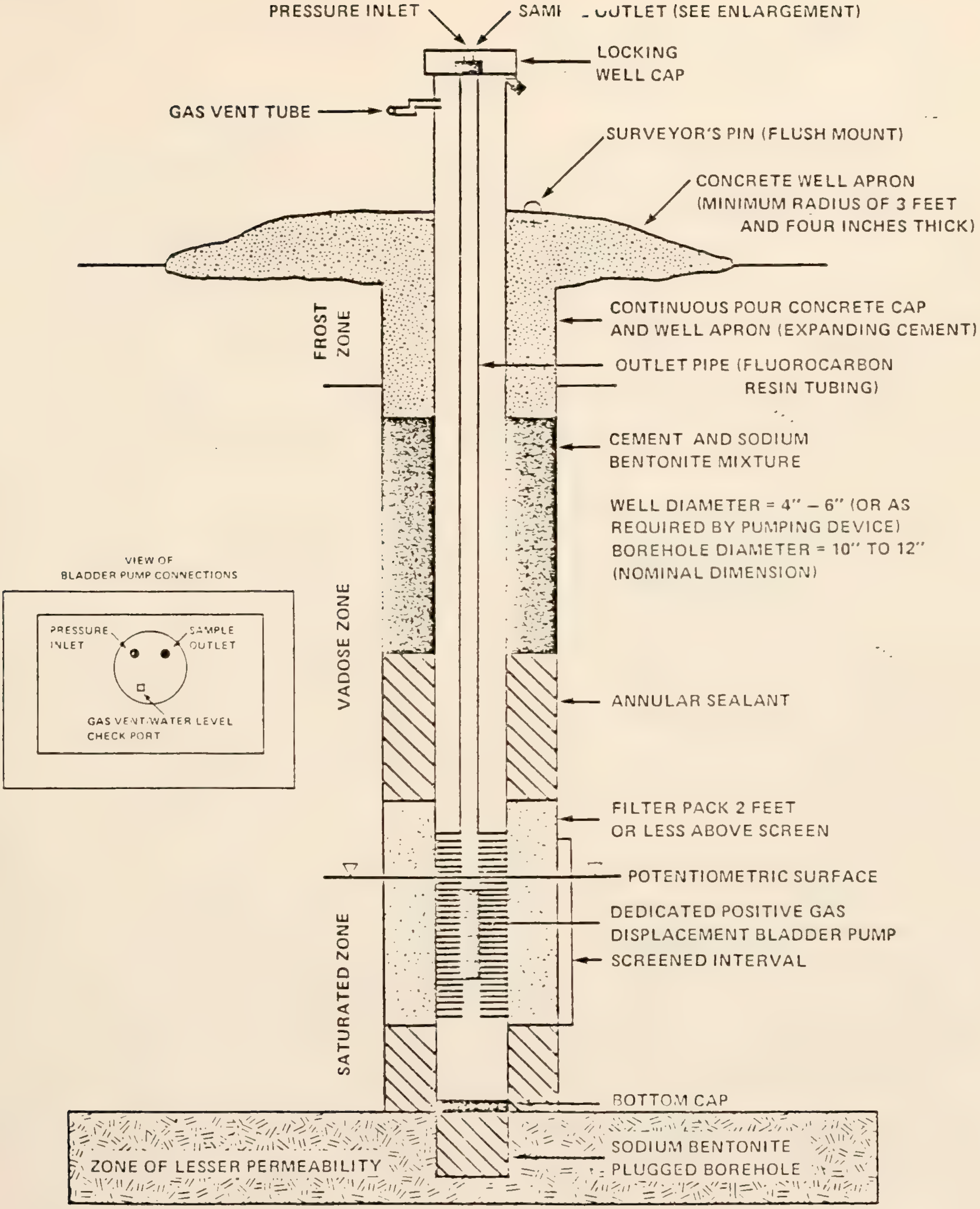
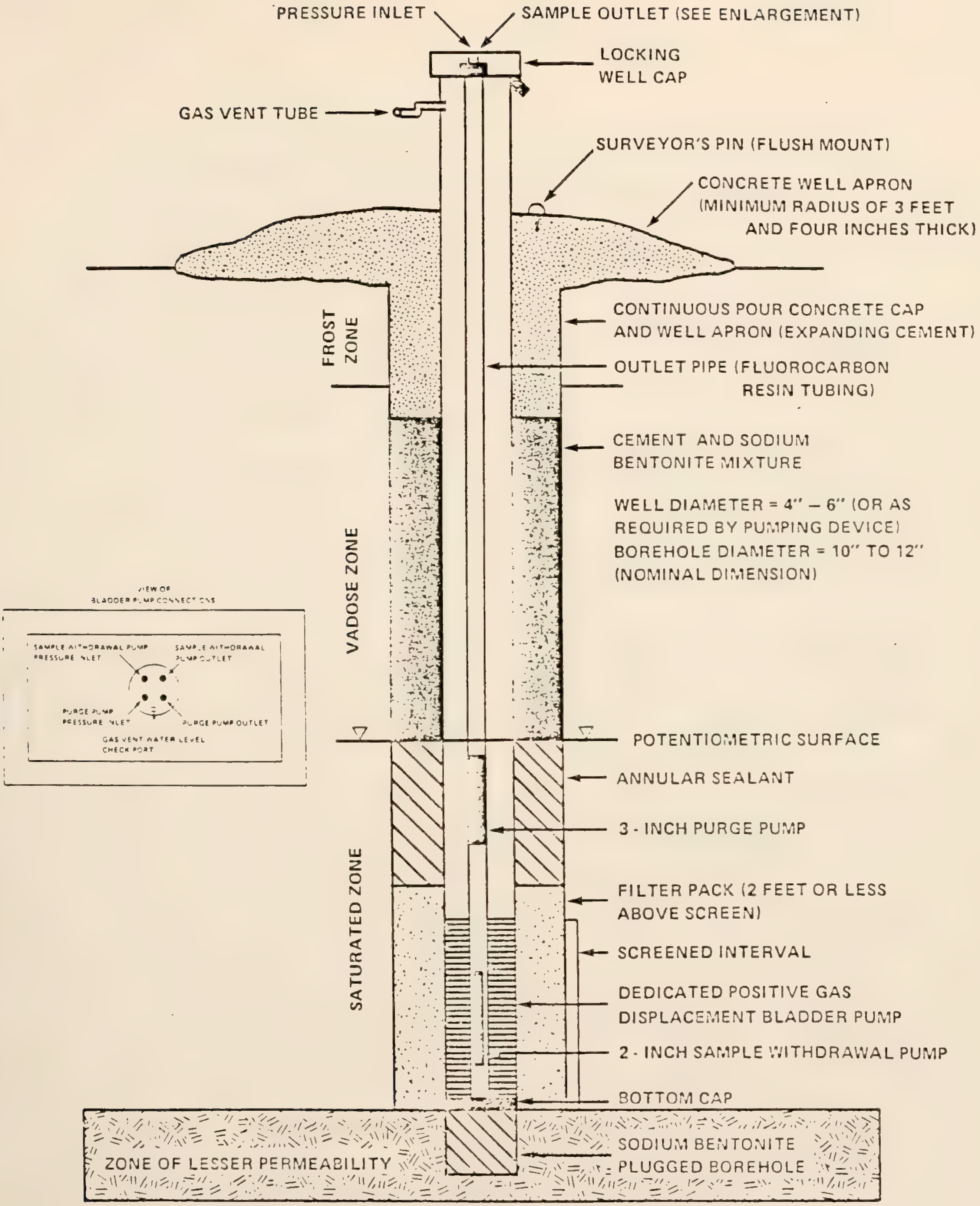

PRESSURE INLET
SAMPLE OUTLET (SEE ENLARGEMENT)
LOCKING WELL CAP
GAS VENT TUBE
SURVEYOR'S PIN (FLUSH MOUNT)
CONCRETE WELL APRON (MINIMUM RADIUS OF 3 FEET AND FOUR INCHES THICK)
FROST ZONE
CONTINUOUS POUR CONCRETE CAP AND WELL APRON (EXPANDING CEMENT)
OUTLET PIPE (FLUOROCARBON RESIN TUBING)
CEMENT AND SODIUM BENTONITE MIXTURE
WELL DIAMETER = 4" – 6" (OR AS REQUIRED BY PUMPING DEVICE)
BOREHOLE DIAMETER = 10" TO 12" (NOMINAL DIMENSION)
VIEW OF BLADDER PUMP CONNECTIONS
PRESSURE INLET
SAMPLE OUTLET
GAS VENT-WATER LEVEL CHECK PORT
VADOSE ZONE
ANNULAR SEALANT
FILTER PACK 2 FEET OR LESS ABOVE SCREEN
POTENTIOMETRIC SURFACE
DEDICATED POSITIVE GAS DISPLACEMENT BLADDER PUMP
SCREENED INTERVAL
SATURATED ZONE
BOTTOM CAP
SODIUM BENTONITE PLUGGED BOREHOLE
ZONE OF LESSER PERMEABILITY

FIGURE 3-5 MONITORING WELL CROSS-SECTION – DEDICATED POSITIVE GAS DISPLACEMENT BLADDER PUMP SYSTEM.

an appropriate cross section of a well that uses a dedicated positive gas displacement bladder pump as the sampling device/well evacuation device. The principal change is the addition of a two-inch diameter pump with fluorocarbon resin outlet tubing to the well. A four-inch interior diameter outer well casing should easily accommodate this additional equipment. However, should a larger pump (e.g., three inches in diameter) be required because of greater well depth or yield, a larger outer casing may prove necessary (six-inch inside diameter). The pump should be positioned midway along the screened interval, and the top of its outlet pipe should extend into the well cap as depicted in Figure 3-5.

If light and dense-phase immiscible layers are presumed to be present, the owner/ operator must obtain discrete samples of them. The well system should have been designed to allow sampling of both light and dense phases by using a well screen that extends from above the potentiometric surface to the lower confining layer. Where well clusters are employed, one well in the cluster may be screened at horizons where floaters are expected (e.g., potentiometric surface, Figure 3-5), another at horizons where dense phases are expected (e.g., aquifer/aquiclude interface, Figure 3-6), and others within other portions of the uppermost aquifer.

A periodic check of the dedicated sampling system should be exercised to prevent damage and maximize efficiency. This inspection should include removal of samples for verification of proper function. The design of the dedicated sampling system should also allow access for regular testing of aquifer characteristics. It is also recommended that the well be periodically resurveyed using the protective casing and apron (constructed to specific dimensions, Figure 3-1) as points of reference. An option that can be exercised in constructing a monitoring well (e.g., dedicated sampler) is the use of fine sand at the top of the filter pack to reduce or minimize invasion.


PRESSURE INLET
SAMPLE OUTLET (SEE ENLARGEMENT)
LOCKING WELL CAP
GAS VENT TUBE
SURVEYOR'S PIN (FLUSH MOUNT)
CONCRETE WELL APRON (MINIMUM RADIUS OF 3 FEET AND FOUR INCHES THICK)
FROST ZONE
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PURGE PUMP OUTLET
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POTENTIOMETRIC SURFACE
ANNULAR SEALANT
3 - INCH PURGE PUMP
SATURATED ZONE
FILTER PACK (2 FEET OR LESS ABOVE SCREEN)
SCREENED INTERVAL
DEDICATED POSITIVE GAS DISPLACEMENT BLADDER PUMP
2 - INCH SAMPLE WITHDRAWAL PUMP
BOTTOM CAP
ZONE OF LESSER PERMEABILITY
SODIUM BENTONITE PLUGGED BOREHOLE

FIGURE 3-6 MONITORING WELL CROSS-SECTION – DEDICATED PURGE PUMP AND SAMPLE WITHDRAWAL PUMP. WELL SCREENED IN A HIGH YIELDING AQUIFER.

3.7 Evaluation of Existing Wells

The technical reviewer must decide whether wells--as designed and constructed--allow for the collection of representative ground-water samples. There are two situations the technical reviewer may encounter: (1) where existing wells produce consistently turbid samples, i.e., greater than 5 N.T.U. (F.T.U. or J.T.U. depending on the method used), and (2) where the owner/operator can produce little or no documentation on how the wells were designed and installed.

Wells with turbidity or lack of information on well design and construction may prompt the technical reviewer to order the owner/operator to replace monitoring wells. In other, less obvious, cases the technical reviewer must use best judgment in deciding when to order an owner/operator to replace wells. The technical reviewer must decide whether the owner/operator's wells--as built--allow the sampler to collect representative ground-water samples (40 CFR 265.91(a)). This may not be an easy judgment to make. In cases where it is not clear whether the wells can produce representative ground-water samples, the technical reviewer may consider requiring the owner/operator to conduct a field demonstration. This demonstration would involve the installation of new well(s) near existing wells. The owner/operator would sample and analyze for the same set of parameters in both wells. If parameter values are comparable, the technical reviewer should assume the owner/operator's existing wells are producing representative samples. The field demonstration for existing and new wells will be extremely difficult to evaluate in practice. Differences in construction may or may not manifest themselves during the field test. The results may lead to false conclusions in view of the normal variabilities inherent in water quality parameters or sampling which may be attributed to differences between old and new wells. Similarly, differences in well construction, development, etc., that can never be duplicated may also result in negative or positive biases due to

causes other than well construction. When such situations arise, the wells should be decommissioned, sealed, and replaced. Where the only question is whether or not the well casing material is negatively affecting the chemical quality of the ground-water samples, a side-by-side comparison at selected wells should be undertaken using stainless steel or one of the fluorocarbon resins. If analysis results are comparable, then it is likely that chemical bias is not a major issue at the time of the test.

Once wells have been properly designed and constructed, an appropriate sampling and analysis plan must be developed and implemented. These procedures are discussed in Chapter Four.

REFERENCES

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Code of Federal Regulations. Title 40. Part 265, Environmental Protection Agency Interim Status Standards for Owners and Operators of Hazardous Waste Facilities, Subpart F, Ground-Water Monitoring.

ATTACHMENT IV.8.

Principal Hazardous Constituents

Constituent	PQL ppb	critical level	Recommended Analytical * Method
toluene	2	pql	8020
xylene	5	pql	8020
1-methylnaphthalene	10	pql	8270
naphthalene	200	pql	8310
phenanthrene	200	pql	8100
2-4-dimethylphenol	10	pql	8040
Pb	40 ppb	50 ppb	6010
Cr	70 ppb	pql	6010

* Analytical method number correspond to those listed in SW846, Test Methods for Evaluation of Solid Waste, Third Edition.

ATTACHMENT IV.9.

BACKGROUND WATER QUALITY PARAMETERS

Parameter

Sulfate
pH
Specific Conductance

ATTACHMENT IV.10.

federal register

Thursday
July 9, 1987

Part II

Environmental Protection Agency

40 CFR Parts 264 and 270
List (Phase 1) of Hazardous Constituents for Ground-Water Monitoring; Final Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 264 and 270

[FRL 3199-3]

List (Phase 1) of Hazardous Constituents for Ground-Water Monitoring

AGENCY: U.S. Environmental Protection Agency.

ACTION: Final rule.

SUMMARY: The Environmental Protection Agency is today amending its regulations concerning gound-water monitoring with regard to screening suspected contamination at land based hazardous waste treatment, storage, and disposal facilities. The amendments replace current requirements to analyze for all Appendix VIII constituents with new requirements to analyze for a specified core list of chemicals plus those chemicals specified by the Regional Administrator on a site-specific basis. The Agency proposed today's amendments on July 24, 1986.

DATES: These final regulations become effective on September 28, 1987 which is six months from the date of promulgation, as RCRA Section 3010(b) requires.

ADDRESSES: The official record for this rulemaking (Docket No. F-87-AX9F-FFFFF) is located in the Room MLG100, U.S. Environmental Protection Agency, 401 M Street SW., Washington, DC 20460, and is available for viewing from 9:00 a.m. to 4:00 p.m., Monday through Friday, excluding legal holidays. Call (202) 475-9327 for appointments. The public may copy a maximum of 50 pages of material from any one regulatory docket at no cost. Additional copies cost $.20/page.

FOR FURTHER INFORMATION CONTACT: For general information about this rulemaking contact the RCRA Hotline, Office of Solid Waste (WH-562), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460 (800) 424-9346 (toll free) or (202) 382-3000 in the Washington, D.C. metropolitan area.

For information on specific aspects of this rule contact: Jerry R. Garman, Office of Solid Waste (WH-565E), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460 (202) 382-4658.

SUPPLEMENTARY INFORMATION:

Preamble Outline

I. Authority
II. Summary of Today's Final Rule
III. Background
  A. Regulatory Framework
  B. Origin of Today's Final Rule
IV. Issues Discussed in Proposed Rule
  A. Borderline Chemicals
  B. Dioxin
  C. Ground-Water Chemistry
  D. Discretionary Additions
  E. Ordering of Appendix IX
  F. Representatives of Categories
V. Analytical Methods
VI. Nature of List
VII. State Authority
  A. Applicability of Rules in Authorized States
  B. Effect on State Authorization
VIII. Effective Date
IX. Executive Order No. 12291 and Regulatory Impact Analysis
X. Regulatory Flexibility Act
XI. Supporting Documents
XII. List of Subjects in 40 CFR Part 264 and 270

I. Authority

These regulations are being promulgated under the authority of Sections 2002(a), 3001, 3004, and 3005 of the Solid Waste Disposal Act, as amended, 42 U.S.C. 6912, 6921, 6924, and 6925 (commonly referred to as RCRA).

II. Summary of Today's Final Rule

Today's rule creates a new list of analytes for RCRA: Appendix IX to 40 CFR Part 264. This list is required only for ground-water monitoring at RCRA land based hazardous waste disposal units. This final rule, in concert with the regulations already in place, will require that an analysis of all the constituents in Appendix IX to Part 264 be performed on the ground water taken from wells surrounding those units. This analysis takes place when ground-water contamination is first detected, and then again once per year (see 40 CFR Part 264, Subpart F).

III. Background

A. Regulatory Framework

Subtitle C of the Resource Conservation and Recovery Act of 1976 (RCRA) creates a comprehensive program for the safe management of hazardous waste. Section 3004 of RCRA requires owners and operators of facilities that treat, store, or dispose of hazardous waste to comply with standards established by EPA that are "necessary to protect human health and the environment." Section 3005 provides that owners and operators of certain facilities that apply for a permit and comply with applicable notice requirements may operate until a permit determination is made. Facilities in this category are said to be operating under "interim status". Owners and operators of interim status facilities also must comply with standards set under Section 3004.

EPA promulgated standards for protecting ground water from releases of hazardous wastes from treatment, storage, and disposal units at interim status facilities in 1980 (45 FR 33154 (May 19, 1980)), codified in 40 CFR Part 265, Subpart F, and permitted facilities in 1982 (47 FR 32274 (July 26, 1982)), codified in 40 CFR Part 264, Subpart F. Both programs require owners and operators to sample ground water at specified intervals to determine whether or not hazardous wastes or constituents from the facility are contaminating ground water. As explained in more detail below, these sampling procedures have generated criticism.

The regulations promulgated on May 19, 1980 set forth criteria for identifying "hazardous" waste. To assist in this identification process, EPA developed a list of chemicals ". . . that have been shown in reputable scientific studies to have toxic, carcinogenic, mutagenic, or teratogenic effects on humans or other life forms . . . ." (45 FR 33107, May 19, 1980). This list was published as Appendix VIII to Part 261 of the regulations.

The Appendix VIII list is actually a composite of several other lists. It includes chemicals identified as priority pollutants under the Clean Water Act, chemicals identified by the Department of Transportation as hazardous to transport, chemicals for which EPA's Carcinogen Assessment Group (CAG) has laboratory evidence of carcinogenicity, and chemicals which the NIOSH Registry of Toxic Effects of Chemical Substances lists as having high acute toxicity (numerically low LD_{50}).

The principal purpose of the list is to define a universe of chemicals of concern. Wastes would be matched against the list to see if they contained any chemicals from this universe. If so, they would be considered for listing as "hazardous".

Appendix VIII deliberately included many listings that are large categories of chemicals. Chemicals were listed on Appendix VIII as they would exist in a pure state, as opposed to the forms they would be expected to take after being dispersed in the environment. For waste identification purposes these characteristics of Appendix VIII may not present a problem. In looking for hazardous waste, EPA emphasized breadth of coverage. No attempt was made to examine factors such as amount of production or environmental fate in compiling Appendix VIII, although the hazardous waste listing regulations require EPA to consider such factors before listing a waste because it

contains an Appendix VIII chemical (see 40 CFR 261.11(a)(3)). As a result, Appendix VIII contains both prevalent, mobile, and toxic chemicals that present major risks in ground water at hazardous waste sites (e.g., trichloroethylene), as well as chemicals which do not present such risks (e.g., aflatoxins) because of factors such as low prevalence or instability in water.

On July 26, 1982, EPA promulgated RCRA regulations that implemented a strategy for ground-water protection for land-based hazardous waste management units operating under RCRA permits. Once ground-water contamination is suspected, the strategy requires an analysis to determine the nature of the contamination. This information is used to assess the problem, determine the appropriate remedy, determine when the remedy is effective, and insure that no new problems arise during the time the remedy is being applied. In an attempt to be comprehensive, the regulations required that contaminated ground water be analyzed for all constituents contained in Appendix VIII to Part 261.

While appropriate for hazardous waste listing purposes, the Appendix VIII list has presented a number of problems when used for purposes of ground-water monitoring. These include practical analytical problems such as listings which are large categories of chemicals, the dissociation or actual decomposition of many Appendix VIII constituents when placed in water, and the lack of analytical standards or analytical screening methods for many constituents.

EPA has been aware of potential analytical problems with "Appendix VIII analysis" for some time. At the time of promulgation of the 1982 regulations, EPA acknowledged that it lacked analytical methods for nine of the Appendix VIII constituents (see 47 FR 32296, July 26, 1982). When owners and operators of hazardous waste facilities began to attempt Appendix VIII analyses, however, EPA learned that analysis would be extremely difficult or impossible for a larger number of constituents.

EPA took several actions intended to mitigate the problems. For example, EPA recommended the use of enforcement discretion for some of the most intractable problems it had identified at the time. Also, in 1984, EPA proposed to eliminate 22 Appendix VIII constituents from the ground-water analysis requirements (see 49 FR 38786, October 1, 1984).

Comments on the October 1984 proposal raised questions about a number of additional analytical problems. Also, EPA gathered further information from interactions between RCRA permitting authorities, RCRA facility owners and operators, and analytical laboratories. EPA's own experience with ground-water analyses for its ground-water monitoring task force and its analytical methods development work confirmed many of these problems. These experiences demonstrated to EPA that analytical problems with Appendix VIII were far more serious than previously believed. It became clear that a major change was required.

B. Origin of Today's Final Rule

In response to this need, EPA convened a meeting on December 10–13, 1985, of some 30 technical experts representing EPA and State offices and laboratories. Many of these experts had advanced degrees in chemistry and/or substantial laboratory experience. Over four days, they evaluated all of Appendix VIII with regard to the feasibility of analysis of the various constituents. They identified a list of specific chemicals, derived from Appendix VIII, which they considered generally suitable for ground-water analyses at all facilities. They recommended that 25 chemicals, routinely analyzed in ground water by the Superfund office, be added to the list for analysis.

The results of this meeting, and subsequent work by the Agency, were summarized in a Notice of Proposed Rulemaking on July 24, 1986 (see 40 CFR 26632). Today, EPA is finalizing that proposal. The reasoning behind the final rule is the same as that discussed in the proposal. Appendix IX to Part 264 is made up of those compounds on Appendix VIII to Part 261 for which it is feasible to analyze in ground-water samples, plus 17 chemicals routinely monitored in the Superfund program.

Fifteen of the 17 chemical entities included from the Superfund program are organic chemicals, the other 2 (tin and cobalt) are metals. These 17 exhibit varying, but significant, degrees of toxicity. All of them have the potential to adversely effect human health or the environment, and are therefore of value for monitoring at RCRA facilities. The docket for this rulemaking contains information, or references to publicly available information, that demonstrates the toxic or hazardous potential of these Superfund additions.

One of the Superfund compounds (benzoic acid) which was on the proposed Appendix IX is not on the final Appendix IX because there is currently no acceptable screening method for it. Benzoic acid requires a derivatization before it will yield itself to gas chromotographic analysis. The rest of the Superfund additions to Appendix IX are readily amenable to analysis.

The other 7 Superfund items that were a part of the proposed Appendix IX and are not a part of the final Appendix, are relatively non-toxic inorganics. These are addressed below under "Ground-Water Chemistry".

The majority of the data evaluated for this rule are contained in background documents for the July 24, 1986, Proposed Rulemaking. However, during the public comment period of this proposed rulemaking, EPA received more data concerning the feasibility of analyzing certain Appendix VIII constituents in ground water. This data was evaluated on December 11, 1986, at a meeting of analytical experts. A list of the attendees of this meeting, the new data received by EPA since the proposal, and the group's decision concerning the feasibility of analysis, are contained in background documentation for this rule.

IV. Issues Discussed in Proposed Rule

In addition to solicitating comment on EPA's overall approach, the July 24, 1986 Notice of Proposed Rulemaking, raised six specific issues for comment. The following is a brief description of these issues, the comments received on each, and the Agency's response to those comments.

A. Borderline Chemicals

In the July 24, 1986 proposal EPA listed 48 chemicals for which the Agency had conflicting data pertaining to their analytical feasibility. A few commentors supplied new data or an opinion about these compounds. The new data was evaluated at the aforementioned December 11, 1986 meeting of analytical experts. A decision was made as to whether or not each chemical belonged on the final Appendix IX based on the criteria discussed in the proposal (see 51 FR 26635–36). In sum, five of the compounds not on the proposed Appendix IX, but listed as borderline, have been added to the final Appendix IX because it was determined that they were amendable to the analytical screening methodologies. Likewise, thirteen of the borderline chemicals that were on the proposed Appendix IX have been removed from the final list because new data had demonstrated that they were not suitable for screening analysis. The background documentation for this final rule elaborates upon those decisions.

B. Dioxin

Although, the proposed Appendix IX contained polychlorinated dibenzo-p-dioxins, the proposed rulemaking questioned whether requiring the analysis of these dioxins presents a human health or environmental risk in itself. Several of the comments EPA received during the public comment period agreed that requiring these analyses did pose a threat to human health or the environment. However, none of the commentors supplied any new data concerning this issue. Therefore, given that dioxin analyses are currently performed in a number of laboratories with seemingly little adverse effects, and that numerous other highly toxic chemicals are commonly worked within laboratories, the Agency has concluded that requiring dioxin analysis probably does not constitute a significant envronmental hazard in itself. Therefore, since it is feasible to analyze for these dioxins in ground water, they remain on Appendix IX. It should also be noted that many commentors thought that dioxins should not be on Appendix IX because they are rarely, if ever, found in ground water.

C. Ground-Water Chemistry

In the July 24, 1986 proposal, EPA discussed the presence of some constituents on the proposed Appendix IX that were generally non-toxic. These chemical species were either derived from Appendix VIII (e.g., sodium from sodium cyanide) or were part of the Superfund additions. The Agency proposed to include these species on Appendix IX because their analyses provides information on ground-water chemistry and movement. Many commentors argued that such constituents should not be included on Appendix IX if they do not pose a significant hazard. The Agency agrees with these commentors on this issue and has deleted these constituents from Appendix IX. The following table contains those constituents that, while not part of Appendix IX, are valuable for the characterization of subsurface environmental chemistry. It is important to note that while these constituents are unlikely to pose a significant hazard in themselves, the Regional Administrator does have the authority to require monitoring for them on a case-by-case basis if such analyses are necessary to protect human health and the environment (see "Discretionary Additions", below).

TABLE I

Aluminum	Fluoride	Potassium
Bicarbonate/ Carbonate.	Hydrogen Ion (pH).	Silica
Boron	Iron	Sodium
Calcium	Magnesium	Strontium
Chloride	Manganese	Sulfate
	Nitrate	

The constituents in Table I are provided to aid in the evaluation of ground-water quality beneath a hazardous waste facility. Two important reasons for evaluating ground-water quality are: (1) to detect changes in the geochemistry at the facility and (2) to understand the local ground-water chemical environment.

Significant changes from the natural concentration of Table I constituents may indicate the escape of contaminants from the facility. Ground water is frequently classified by the relative abundance of dominant ions (Na^+, Mg^{2+}, Ca^{2+}, Cl^-, HCO_3^-, CO_3^{2-}, SO_4^{2-}, and K^+). Concentrations that differ significantly from normal concentrations in the aquifer can signal chemical equilibrium shifts brought about by the interaction of contaminants and natural constituents. Such interaction may also generate new compounds. In some instances, the detection of concentration changes of the more mobile ions (e.g., Cl^-) may suggest that less mobile contaminants have entered the aquifer closer to the regulated unit. Concentration changes in other Table 1 constituents, such as nitrate, may be controlled by biochemical processes acting on subsurface contaminants.

The local ground-water chemistry may affect contaminant transport by modifying both the solubility of the Appendix IX constituents and the relevant concentration gradients. The solubility of a particular constituent is influenced by several parameters: temperature, pressure, pH, oxidation-reduction potential (Eh), and the concentration of other constituents. Iron and magnesium, which naturally occur in ground-waters, may cause otherwise low mobility organic substances to move more freely. The bicarbonate/carbonate system frequently regulates the pH of ground-water, and thus the solubility of contaminants.

Chemical concentration gradients, which may be determined partly by natural chemistry, become more important when ground-water velocities are low. The dispersion of contaminants in directions transverse to the ground-water flow path may be governed by prevailing concentration gradients.

D. Discretionary Additions

EPA currently has the authority under 40 CFR 270.32(b)(2) and Section 3005(c)(3) of RCRA as amended in 1984, to require the analysis of chemicals outside Appendix IX where necessary to protect human health and the environment. In the July 24, 1986 proposal, an option to make the authority explicit in the Part 264 regulations was noted for public comment. A number of commentors expressed the opinion that site-specific additions to Appendix IX were acceptable if a suitable analytical method existed. The few commentors that directly addressed the issue of explicit authority were almost equally divided in their opinion on whether or not the authority should be made more explicit. EPA has decided that the above authorities for site-specific analyses are sufficient at this time to require additional analyses of chemicals outside of Appendix IX.

E. Ordering of Appendix IX

The proposed Appendix IX was alphabetically ordered by systematic name. The Agency solicited comment on how the final list should be ordered. Of those organizations that commented on this issue, half desired ordering by systematic name, and half by common name. EPA has decided to order the list by alphabetic common name, in keeping with the form often used in other Agency lists. Appendix IX also contains the Chemical Abstract Service registry number and the Chemical Abstract Service index name.

F. Representatives of Categories

In making the transition from Appendix VIII of Part 261 to Appendix IX of Part 264, EPA selected specific chemicals for inclusion on Appendix IX to replace the listings of categories of Appendix VIII. While few commentors addressed the listing of the specific chemical for this reason, in general, the comments EPA received were quite supportive of the Agency's decision on this issue. EPA stands by this earlier decision. The final Appendix IX contains a number of chemicals that, while not specifically included on Appendix VIII, are members of categories that are contained on that list.

V. Analytical Methods

The fundamental concern of EPA in the formulation of Appendix IX was that all the constituents on the list be readily amenable to EPA's standard analytical methods for screening, i.e., methods that determine whether hazardous

constituents are present in ground-water samples containing unknown amounts of unidentified chemicals. With this rule, EPA believes this goal has been met. In order to facilitate the analysis of these compounds, the Agency has included two additional columns in the regulatory list besides those columns that identify the constituent of concern. The fourth column contains some suggested methods from "Testing Methods for Evaluating Solid Waste" (SW–846). SW–846 is the general RCRA analytical methods manual that is currently in its third edition. It is important to note that some of the methods described in SW–846 are less appropriate for screening and are better suited to routine monitoring where the analyst is fairly sure which chemicals are present. Copies of the manual (order #:955–001–00000–1) are available from the U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20402, (202) 783–3238. The list of suggested SW–846 methods is not part of the regulation; EPA does not require the use of these methods for Appendix IX analyses. The Agency believes that these methods will provide acceptable analytical results.

The fifth column in Appendix IX contains estimates of a practical quantitation limit for the particular constituent by a method. The "practical quantification limit" (pql) is defined in SW–846. These pql's are EPA's current best estimate of the practical sensitivity of the applicable method for RCRA ground-water monitoring purposes. It should be noted that some listed pql values may be unattainable in some situations since they were based on general estimates for the method and not on data for the specific substance. Again, this column is included for guidance purposes and is not a regulatory requirement. In some cases, due to site and sample specific factors, these limits may not be reached. However, if a laboratory finds that it has large deviations from these limits, attempts should be made to identify the causes for these discrepancies.

It should be noted that the Suggested Methods column does not contain all applicable SW–846 methods. In some circumstances, other SW–846 methods may be preferred. Where more than one method is listed, the method with the lowest pql is usually to be preferred. Alternatively, in some cases it is possible to modify a method to achieve the lowest pql for the analyte.

Because of the ongoing nature of analytical methods development, not all of the chemicals on Appendix IX are specifically addressed in SW–846. However, the Agency plans to rectify this situation in future updates to SW–846. Until that time, the fourth and fifth columns of Appendix IX should assist laboratories in performing the necessary analyses.

A background document for this rulemaking may also be of help to laboratories. The document, "Summary of Appropriate Methods for Appendix IX" lists those method(s) which are appropriate for each Appendix IX constituent, and references the applicable sections SW–846 or one of several methods development documents, as well as supplying some basic analytical data (e.g., retention time). This document is available in the docket for this rulemaking.

VI. Nature of List

EPA wishes to make it clear that Appendix IX, like other analyte lists, is a "living" list. That is, Appendix IX is likely to change over time. With the development and standardization of new technologies and methods, Appendix IX will likely require revision. Moreover, the basis for Appendix IX to Part 264 is Appendix VIII to Part 261. Changes to Appendix VIII may require modifications to Appendix IX. EPA is open, at anytime, to new data and information that may affect these decisions.

With this rule EPA completes the first phase of a two phase effort. While Appendix IX essentially solves the problem of requiring monitoring for only those constituents for which it is possible to analyze, it does not address the question of what are the most appropriate analytes for this purpose. This question will be dealt with in future rulemakings.

VII. State Authority

A. Applicability of Rules in Authorized States

Under Section 3006 of RCRA, EPA may authorize qualified States to administer and enforce the RCRA program within the State. (See 40 CFR Part 271 for the standards and requirements for authorization.) Following authorization, the Agency retains enforcement authority under Sections 3008, 7003 and 3013 of RCRA, although authorized States have primary enforcement responsibility.

Prior to the Hazardous and Solid Waste Amendments of 1984 (HSWA), a State with final authorization administered its hazardous waste program entirely in lieu of the Federal program. The Federal requirements no longer applied in the authorized State, and the Agency could not issue permits for any facilities in a State where the State was authorized to permit. When new, more stringent Federal requirements were promulgated or enacted, the State was obligated to enact equivalent authority within specified time frames. New federal requirements did not take effect in an authorized State until the State adopted the requirements as State law.

In contrast, under Section 3006(g) of RCRA, 42 U.S.C. 6926(g), new requirements and prohibitions imposed by HSWA take effect in authorized States at the same time that they take effect in nonauthorized States. The Agency is directed to carry out those requirements and prohibitions in authorized States, including the issuance of permits, until the State is granted authorization to do so. While States must still adopt HSWA-related provisions as State law to retain final authorization, the HSWA applies in authorized States in the interim.

B. Effect on State Authorization

Today's rule promulgates standards that are not effective in authorized States since the requirements are not being imposed pursuant to Hazardous and Solid Waste Amendments of 1984. Thus, the requirements will be applicable only in those States that do not have final authorization. In authorized States, the requirements will not be applicable until the State revises its program to adopt equivalent requirements under State law. Since states may always impose requirements which are more stringent or have greater coverage then EPA's programs, States will not be required to revise their regulations to reflect the deletions of constituents from the current monitoring requirements, although they may choose to do so. Regulations which are broader in scope, however, may not be enforced as part of the Federally-authorized RCRA program.

40 CFR 271.21(e)(2) requires States that have final authorization to modify their programs to reflect Federal program changes, and to subsequently submit the modification to EPA for approval. The deadline by which the State must modify its program to adopt today's rule is July 1988. These deadlines can be extended in exceptional cases (40 CFR 271.21(e)(3)). Once EPA approves the revision, the State requirements become Subtitle C RCRA requirements.

States with authorized RCRA programs may already have requirements similar to those in today's rule. These State requirements have not been assessed against the Federal

regulations being promulgated today to determine whether they meet the tests for authorization. Thus, a State is not authorized to carry out these requirements in lieu of the Agency until the State requirements are approved. Of course, States with existing standards may continue to administer and enforce their standards as a matter of State law.

States that submit official applications for final authorization less than 12 months after the effective date of these standards are not required to include standards equivalent to these standards in their application. However, the State must modify its program by the deadlines set forth in §271.21(e). States that submit official applications for final authorization 12 months after the effective date of those standards must include standards equivalent to these standards in their application. 40 CFR 271.3 sets forth the requirements a State must meet when submitting its final authorization application.

VIII. Effective Date

Pursuant to Section 3010(b) of RCRA, today's amendments will be effective six months after promulgation.

IX. Executive Order No. 12291 and Regulatory Impact Analysis

Under Executive Order 12291, the Agency must judge whether a regulation is "major" and, therefore, subject to the requirement of a Regulatory Impact Analysis. As stated in the proposed rule on July 24, 1986, the Agency does not believe these conforming changes will result in an annual effect on the economy of $100 million or more; a major increase in costs of prices of consumers, individual industries, Federal, State, or local government agencies, or geographic regions; or significant adverse effects on competition, employment, investment, productivity, innovation, or in domestic or export markets. The Agency believes that today's rule is not a mojor rule under Executive Order 12291 and therefore, has not prepared a Regulatory Impact Analysis (RIA). This regulation was submitted to the Office of Management and Budget for review as required by Executive Order 12291.

X. Regulatory Flexibility Act

Under the Regulatory Flexibility Act, (5 U.S.C. 601 et seq.), the Agency must prepare a regulatory flexibility analysis for all regulations that may have a significant impact on a substantial number of small entities. The Agency conducted such an analysis on the land disposal regulations and published a summary of the results in the Federal Register, Vol. 48, No. 15 on January 21, 1983. Today's conforming regulation does not impose significant additional burdens. In addition, they do not impose any requirements beyond those required for permitting facilities under Part 264. Therefore, pursuant to 5 U.S.C. 601(b), I certify that this regulation will not have a significant economic impact on a substantial number of small entities.

XI. Supporting Documents

The docket (see "Addresses") for this rulemaking contains the new data EPA received concerning the analytical feasibility of these compounds since the time the proposed rule was published in the Federal Register. The docket also contains a chemical-by-chemical summary of any compounds that were re-examined since the time of the proposal, as well as a report of the aforementioned December 11, 1986 meeting of analytical experts. The background document "Summary of Appropriate Methods for Appendix IX" (see "Analytical Methods") is also available in the docket.

XII. Lists of Subjects in 40 CFR Parts 264 and 270

Hazardous materials, Reporting and Recordkeeping Requirements, Waste Treatment and Disposal, and Water Supply, Administrative Practice and Procedure, Ground Water, Environmental Monitoring.

Dated: June 19, 1987.

Lee M. Thomas,

Administrator.

For the reasons set out in the preamble, Title 40 of the Code of Federal Regulations is amended as follows:

PART 264—AMENDED

1. The authority citation for Part 264 is revised to read as follows:

Authority: Secs. 1006, 2002(a), 3001, 3004, and 3005 of the Solid Waste Disposal Act, as amended, 42 U.S.C. 6905, 6912(a), 6924 and 6925.

2. Section 264.98 is amended by revising paragraphs (h)(2), (h)(3) introductory text and (h)(4)(i) introductory text to read as follows:

§ 264.98 Detection monitoring program.

* * * * *

(h) * * *

(2) Immediately sample the ground water in all monitoring wells and determine whether constituents identified in the list in Appendix IX of Part 264 are present and, if so, at what concentration.

* * * * *

(3) Establish a background value for each constituent that has been found at the compliance point under paragraph (h)(2) of this section, as follows:

* * * * *

(4) * * *

(i) An identification of the concentration of each constituent found in the ground water at each monitoring well at the compliance point:

* * * * *

3. Section 264.99 is amended by revising paragraph (f) to read as follows:

§ 264.99 Compliance monitoring program.

* * * * *

(f) The owner or operator must analyze samples from all monitoring wells at the compliance point to determine whether constituents identified in the list in Appendix IX to Part 264 of this chapter are present and, if so, at what concentration. The analysis must be conducted at least annually to determine whether additional Appendix IX constituents are present in the uppermost aquifer. If the owner or operator finds constituents from Appendix IX in the ground water that are not already identified in the permit as monitoring constituents, the owner or operator must report the concentration of these additional constituents to the Regional Administrator within seven days after completion of the analysis.

* * * * *

Appendix VII and VIII [Reserved]

4. A new Appendix VII and Appendix VIII are added to Part 264 and reserved as follows:

Appendix VII (reserved)
Appendix VIII (reserved)

5. A new Appendix IX is added to Part 264 as follows:

APPENDIX IX—GROUND-WATER MONITORING LIST [1]

Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	PQL (µg/L) [6]
Acenaphthene	83-32-9	Acenaphthylene, 1,2-dihydro-	8100	200
			8270	10
Acenaphthylene	208-96-8	Acenaphthylene	8100	200
			8270	10
Acetone	67-64-1	2-Propanone	8240	100
Acetophenone	98-86-2	Ethanone, 1-phenyl-	8270	10
Acetonitrile; Methyl cyanide	75-05-8	Acetonitrile	8015	100
2-Acetylaminofluorene; 2-AAF	53-96-3	Acetamide, N-9H-fluoren-2-yl-	8270	10
Acrolein	107-02-8	2-Propenal	8030	5
			8240	5
Acrylonitrile	107-13-1	2-Propenenitrile	8030	5
			8240	5
Aldrin	309-00-2	1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro- (1α,4α,4aβ,5α,8α,8aβ)-	8080	0.05
			8270	10
Allyl chloride	107-05-1	1-Propene, 3-chloro-	8010	5
			8240	100
4-Aminobiphenyl	92-67-1	[1,1'-Biphenyl]-4-amine	8270	10
Aniline	62-53-3	Benzenamine	8270	10
Anthracene	120-12-7	Anthracene	8100	200
			8270	10
Antimony	(Total)	Antimony	6010	300
			7040	2,000
			7041	30
Aramite	140-57-8	Sulfurous acid, 2-chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester	8270	10
Arsenic	(Total)	Arsenic	6010	500
			7060	10
			7061	20
Barium	(Total)	Barium	6010	20
			7080	1,000
Benzene	71-43-2	Benzene	8020	2
			8240	5
Benzo[a]anthracene; Benzanthracene	56-55-3	Benz[a]anthracene	8100	200
			8270	10
Benzo[b]fluoranthene	205-99-2	Benz[e]acephenanthrylene	8100	200
			8270	10
Benzo[k]fluoranthene	207-08-9	Benzo[k]fluoranthene	8100	200
			8270	10
Benzo[ghi]perylene	191-24-2	Benzo[ghi]perylene	8100	200
			8270	10
Benzo[a]pyrene	50-32-8	Benzo[a]pyrene	8100	200
			8270	10
Benzyl alcohol	100-51-6	Benzenemethanol	8270	20
Beryllium	(Total)	Beryllium	6010	3
			7090	50
			7091	2
alpha-BHC	319-84-6	Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1α,2α,3β,4α,5β,6β)-	8080	0.05
			8250	10
beta-BHC	319-85-7	Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1α,2β,3α,4β,5α,6β)-	8080	0.05
			8250	40
delta-BHC	319-86-8	Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1α,2α 3α,4β,5α,6β)-	8080	0.1
			8250	30
gamma-BHC; Lindane	58-89-9	Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1α,2α,3β,4α,5α,6β)-	8080	0.05
			8250	10
Bis(2-chloroethoxy)methane	111-91-1	Ethane, 1,1'-[methylenebis (oxy)]bis[2-chloro-	8270	10
Bis(2-chloroethyl)ether	111-44-4	Ethane, 1,1'-oxybis[2-chloro-	8270	10
Bis(2-chloro-1-methylethyl) ether; 2,2'-Dichlorodiisopropyl ether	108-60-1	Propane, 2,2'-oxybis[1-chloro-	8010	100
			8270	10
Bis(2-ethylhexyl) phthalate	117-81-7	1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl)ester	8060	20
			8270	10
Bromodichloromethane	75-27-4	Methane, bromodichloro-	8010	1
			8240	5
Bromoform; Tribromomethane	75-25-2	Methane, tribromo-	8010	2
			8240	5

APPENDIX IX—GROUND-WATER MONITORING LIST [1]—Continued

Common name [3]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	PQL (µg/L) [6]
4-Bromophenyl phenyl ether	101-55-3	Benzene, 1-bromo-4-phenoxy-	8270	10
Butyl benzyl phthalate; Benzyl butyl phthalate	85-68-7	1,2-Benzenedicarboxylic acid, butyl phenylmethyl ester	8060	5
			8270	10
Cadmium	(Total)	Cadmium	6010	40
			7130	50
			7131	1
Carbon disulfide	75-15-0	Carbon disulfide	8240	5
Carbon tetrachloride	56-23-5	Methane, tetrachloro-	8010	1
			8240	5
Chlordane	57-74-9	4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-	8080	0.1
			8250	10
p-Chloroaniline	106-47-8	Benzenamine, 4-chloro-	8270	20
Chlorobenzene	108-90-7	Benzene, chloro-	8010	2
			8020	2
			8240	5
Chlorobenzilate	510-15-6	Benzeneacetic acid, 4-chloro-α-(4-chlorophenyl)-α-hydroxy-, ethyl ester	8270	10
p-Chloro-m-cresol	59-50-7	Phenol, 4-chloro-3-methyl-	8040	5
			8270	20
Chloroethane; Ethyl chloride	75-00-3	Ethane, chloro-	8010	5
			8240	10
Chloroform	67-66-3	Methane, trichloro-	8010	0.5
			8240	5
2-Chloronaphthalene	91-58-7	Naphthalene, 2-chloro-	8120	10
			8270	10
2-Chlorophenol	95-57-8	Phenol, 2-chloro-	8040	5
			8270	10
4-Chlorophenyl phenyl ether	7005-72-3	Benzene, 1-chloro-4-phenoxy-	8270	10
Chloroprene	126-99-8	1,3-Butadiene, 2-chloro-	8010	50
			8240	5
Chromium	(Total)	Chromium	6010	70
			7190	500
			7191	10
Chrysene	218-01-9	Chrysene	8100	200
			8270	10
Cobalt	(Total)	Cobalt	6010	70
			7200	500
			7201	10
Copper	(Total)	Copper	6010	60
			7210	200
m-Cresol	108-39-4	Phenol, 3-methyl-	8270	10
o-Cresol	95-48-7	Phenol, 2-methyl-	8270	10
p-Cresol	106-44-5	Phenol, 4-methyl-	8270	10
Cyanide	57-12-5	Cyanide	9010	40
2,4-D; 2,4-Dichlorophenoxyacetic acid	94-75-7	Acetic acid, (2,4-dichlorophenoxy)-	8150	10
4,4'-DDD	72-54-8	Benzene 1,1'-(2,2-dichloroethylidene)bis[4-chloro-	8080	0.1
			8270	10
4,4'-DDE	72-55-9	Benzene 1,1'-(dichloroethylidene)bis[4-chloro-	8080	0.05
			8270	10
4,4'-DDT	50-29-3	Benzene 1,1'-(2,2,2-trichloroethylidene)bis[4-chloro-	8080	0.1
			8270	10
Diallate	2303-16-4	Carbamothioic acid, bis(1-methylethyl)- , S- (2,3-dichloro-2-propenyl) ester	8270	10
Dibenz[a,h]anthracene	53-70-3	Dibenz[a,h]anthracene	8100	200
			8270	10
Dibenzofuran	132-64-9	Dibenzofuran	8270	10
Dibromochloromethane; Chlorodibromomethane	124-48-1	Methane, dibromochloro-	8010	1
			8240	5
1,2-Dibromo-3-chloropropane; DBCP	96-12-8	Propane, 1,2-dibromo-3-chloro-	8010	100
			8240	5
			8270	10
1,2-Dibromoethane; Ethylene dibromide	106-93-4	Ethane, 1,2-dibromo-	8010	10
			8240	5
Di-n-butyl phthalate	84-74-2	1,2-Benzenedicarboxylic acid, dibutyl ester	8060	5
			8270	10
o-Dichlorobenzene	95-50-1	Benzene, 1,2-dichloro-	8010	2
			8020	5
			8120	10
			8270	10

APPENDIX IX—GROUND-WATER MONITORING LIST [1]—Continued

Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	PQL (µg/L) [6]
m-Dichlorobenzene	541-73-1	Benzene, 1,3-dichloro-	8010	5
			8020	5
			8120	10
			8270	10
p-Dichlorobenzene	106-46-7	Benzene, 1,4-dichloro-	8010	2
			8020	5
			8120	15
			8270	10
3,3'-Dichlorobenzidine	91-94-1	[1,1'-Biphenyl]-4,4'-diamine, 3,3'-dichloro-	8270	20
trans-1,4-Dichloro-2-butene	110-57-6	2-Butene, 1,4-dichloro-, (E)-	8240	5
Dichlorodifluoromethane	75-71-8	Methane, dichlorodifluoro-	8010	10
			8240	5
1,1-Dichloroethane	75-34-3	Ethane, 1,1-dichloro-	8010	1
			8240	5
1,2-Dichloroethane; Ethylene dichloride	107-06-2	Ethane, 1,2-dichloro-	8010	0.5
			8240	5
1,1-Dichloroethylene; Vinylidene chloride	75-35-4	Ethene, 1,1-dichloro-	8010	1
			8240	5
trans-1,2-Dichloroethylene	156-60-5	Ethene, 1,2-dichloro-, (E)-	8010	1
			8240	5
2,4-Dichlorophenol	120-83-2	Phenol, 2,4-dichloro-	8040	5
			8270	10
2,6-Dichlorophenol	87-65-0	Phenol, 2,6-dichloro-	8270	10
1,2-Dichloropropane	78-87-5	Propane, 1,2-dichloro-	8010	0.5
			8240	5
cis-1,3-Dichloropropene	10061-01-5	1-Propene, 1,3-dichloro-, (Z)-	8010	20
			8240	5
1,3-Dichloropropene	10061-02-6	1-Propene, 1,3-dichloro-, (E)-	8010	5
			8240	5
n	60-57-1	2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1aα,2β,2aα,3β,6β,6aα,7β,7aα)-	8080	0.05
			8270	10
Diethyl phthalate	84-66-2	1,2-Benzenedicarboxylic acid, diethyl ester	8060	5
			8270	10
O,O-Diethyl O-2-pyrazinyl phosphorothioate; Thionazin	297-97-2	Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester	8270	10
Dimethoate	60-51-5	Phosphorodithioic acid, O,O-dimethyl S-[2-(methylamino)-2-oxoethyl] ester	8270	10
p-(Dimethylamino)azobenzene	60-11-7	Benzenamine, N,N-dimethyl-4-(phenylazo)-	8270	10
7,12-Dimethylbenz[a]anthracene	57-97-6	Benz[a]anthracene, 7,12-dimethyl-	8270	10
3,3'-Dimethylbenzidine	119-93-7	[1,1'-Biphenyl]-4,4'-diamine, 3,3'-dimethyl-	8270	10
alpha, alpha-Dimethylphenethylamine	122-09-8	Benzeneethanamine, α,α-dimethyl-	8270	10
2,4-Dimethylphenol	105-67-9	Phenol, 2,4-dimethyl-	8040	5
			8270	10
Dimethyl phthalate	131-11-3	1,2-Benzenedicarboxylic acid, dimethyl ester	8060	5
			8270	10
m-Dinitrobenzene	99-65-0	Benzene, 1,3-dinitro-	8270	10
4,6-Dinitro-o-cresol	534-52-1	Phenol, 2-methyl-4,6-dinitro-	8040	150
			8270	50
2,4-Dinitrophenol	51-28-5	Phenol, 2,4-dinitro-	8040	150
			8270	50
2,4-Dinitrotoluene	121-14-2	Benzene, 1-methyl-2,4-dinitro-	8090	0.2
			8270	10
2,6-Dinitrotoluene	606-20-2	Benzene, 2-methyl-1,3-dinitro-	8090	0.1
			8270	10
Dinoseb; DNBP; 2-sec-Butyl-4,6-dinitrophenol	88-85-7	Phenol, 2-(1-methylpropyl)-4,6-dinitro-	8150	1
			8270	10
Di-n-octyl phthalate	117-84-0	1,2-Benzenedicarboxylic acid, dioctyl ester	8060	30
			8270	10
1,4-Dioxane	123-91-1	1,4-Dioxane	8015	150
Diphenylamine	122-39-4	Benzenamine, N-phenyl-	8270	10
'oton	298-04-4	Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)- S-[2-ethyl]ester	8140	2
			8270	10
sulfan I	959-98-8	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide, (3α,5aβ,6α,9α,9aβ)-	8080	0.1
			8250	10

APPENDIX IX—GROUND-WATER MONITORING LIST [1]—Continued

Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	PQL (µg/L) [6]
Endosulfan II	33213-65-9	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro- 1,5,5a,6,9,9a-hexahydro-, 3-oxide, (3α,5aα,6β,9β,9aα)-	8080	0.05
Endosulfan sulfate	1031-07-8	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro- 1,5,5a,6,9,9a-hexahydro-, 3,3-dioxide.	8080 8270	0.5 10
Endrin	72-20-8	2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1aα,2β,2aβ,3α,6α, 6aβ,7β,7aα)-	8080 8250	0.1 10
Endrin aldehyde	7421-93-4	1,2,4-Methenocyclopenta[cd]pentalene-5-carboxaldehyde, 2,2a,3,3,4,7-hexachlorodecahydro-, (1α,2β,2aβ,4β,4aβ,5β,6aβ,6bβ,7R*)-	8080 8270	0.2 10
Ethylbenzene	100-41-4	Benzene, ethyl-	8020 8240	2 5
Ethyl methacrylate	97-63-2	2-Propenoic acid, 2-methyl-, ethyl ester	8015 8240 8270	10 5 10
Ethyl methanesulfonate	62-50-0	Methanesulfonic acid, ethyl ester	8270	10
Famphur	52-85-7	Phosphorothioic acid, O-[4-[(dimethylamino)sulfonyl]phenyl]-O,O-dimethyl ester	8270	10
Fluoranthene	206-44-0	Fluoranthene	8100 8270	200 10
Fluorene	86-73-7	9H-Fluorene	8100 8270	200 10
Heptachlor	76-44-8	4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-	8080 8270	0.05 10
Heptachlor epoxide	1024-57-3	2,5-Methano-2H-indeno[1,2-b]oxirene, 2,3,4,5,6,7,7-heptachloro-1a,1b,5,5a,6,6a,-hexahydro-, (1aα,1bβ,2α,5α,5aβ,6β,6aα)	8080 8270	1 10
Hexachlorobenzene	118-74-1	Benzene, hexachloro-	8120 8270	0.5 10
Hexachlorobutadiene	87-68-3	1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	8120 8270	5 10
Hexachlorocyclopentadiene	77-47-4	1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-	8120 8270	5 10
Hexachloroethane	67-72-1	Ethane, hexachloro-	8120 8270	0.5 10
Hexachlorophene	70-30-4	Phenol, 2,2′-methylenebis[3,4,6-trichloro-	8270	10
Hexachloropropene	1888-71-7	1-Propene, 1,1,2,3,3,3-hexachloro-	8270	10
2-Hexanone	591-78-6	2-Hexanone	8240	50
Indeno(1,2,3-cd)pyrene	193-39-5	Indeno[1,2,3-cd]pyrene	8100 8270	200 10
Isobutyl alcohol	78-83-1	1-Propanol, 2-methyl-	8015	50
Isodrin	465-73-6	1,4,5,8-Dimethanonaphthalene,1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a hexahydro-(1α,4α,4aβ,5β,8β,8aβ)-	8270	10
Isophorone	78-59-1	2-Cyclohexen-1-one, 3,5,5-trimethyl-	8090 8270	60 10
Isosafrole	120-58-1	1,3-Benzodioxole, 5-(1-propenyl)-	8270	10
Kepone	143-50-0	1,3,4-Metheno-2H-cyclobuta-[cd]pentalen-2-one, 1,1a,3,3a,4,5,5,5a,5b,6-decachlorooctahydro-	8270	10
Lead	(Total)	Lead	6010 7420 7421	40 1,000 10
Mercury	(Total)	Mercury	7470	2
Methacrylonitrile	126-98-7	2-Propenenitrile, 2-methyl-	8015 8240	5 5
Methapyrilene	91-80-5	1,2,Ethanediamine, N,N-dimethyl-N′-2-pyridinyl-N′-(2-thienylmethyl)-	8270	10
Methoxychlor	72-43-5	Benzene, 1,1′-(2,2,2,trichloroethylidene)bis[4-methoxy-	8080 8270	2 10
Methyl bromide; Bromomethane	74-83-9	Methane, bromo-	8010 8240	20 10
Methyl chloride; Chloromethane	74-87-3	Methane, chloro-	8010 8240	1 10
3-Methylcholanthrene	56-49-5	Benz[j]aceanthrylene, 1,2-dihydro-3-methyl-	8270	10
Methylene bromide; Dibromomethane	74-95-3	Methane, dibromo-	8010 8240	15 5
Methylene chloride; Dichloromethane	75-09-2	Methane, dichloro-	8010 8240	5 5

APPENDIX IX—GROUND-WATER MONITORING LIST [1]—Continued

Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	PQL (µg/L) [6]
Methyl ethyl ketone; MEK	78-93-3	2-Butanone	8015	10
			8240	100
Methyl iodide; Iodomethane	74-88-4	Methane, iodo-	8010	40
			8240	5
Methyl methacrylate	80-62-6	2-Propenoic acid, 2-methyl-, methyl ester	8015	2
			8240	5
Methyl methanesulfonate	66-27-3	Methanesulfonic acid, methyl ester	8270	10
2-Methylnaphthalene	91-57-6	Naphthalene, 2-methyl-	8270	10
Methyl parathion; Parathion methyl	298-00-0	Phosphorothioic acid, O,O-dimethyl O-(4-nitrophenyl) ester	8140	0.5
			8270	10
4-Methyl-2-pentanone; Methyl isobutyl ketone	108-10-1	2-Pentanone, 4-methyl-	8015	5
			8240	50
Naphthalene	91-20-3	Naphthalene	8100	200
			8270	10
1,4-Naphthoquinone	130-15-4	1,4-Naphthalenedione	8270	10
1-Naphthylamine	134-32-7	1-Naphthalenamine	8270	10
2-Naphthylamine	91-59-8	2-Naphthalenamine	8270	10
Nickel	(Total)	Nickel	6010	50
			7520	400
o-Nitroaniline	88-74-4	Benzenamine, 2-nitro-	8270	50
m-Nitroaniline	99-09-2	Benzenamine, 3-nitro-	8270	50
p-Nitroaniline	100-01-6	Benzenamine, 4-nitro-	8270	50
Nitrobenzene	98-95-3	Benzene, nitro-	8090	40
			8270	10
o-Nitrophenol	88-75-5	Phenol, 2-nitro-	8040	5
			8270	10
p-Nitrophenol	100-02-7	Phenol, 4-nitro-	8040	10
			8270	50
4-Nitroquinoline 1-oxide	56-57-5	Quinoline, 4-nitro-, 1-oxide	8270	10
[illegible]itrosodi-n-butylamine	924-16-3	1-Butanamine, N-butyl-N-nitroso-	8270	10
[illegible]itrosodiethylamine	55-18-5	Ethanamine, N-ethyl-N-nitroso-	8270	10
[illegible]itrosodimethylamine	62-75-9	Methanamine, N-methyl-N-nitroso-	8270	10
[illegible]itrosodiphenylamine	86-30-6	Benzenamine, N-nitroso-N-phenyl-	8270	10
N-Nitrosodipropylamine; Di-n-propylnitrosamine	621-64-7	1-Propanamine, N-nitroso-N-propyl-	8270	10
N-Nitrosomethylethylamine	10595-95-6	Ethanamine, N-methyl-N-nitroso-	8270	10
N-Nitrosomorpholine	59-89-2	Morpholine, 4-nitroso-	8270	10
N-Nitrosopiperidine	100-75-4	Piperidine, 1-nitroso-	8270	10
N-Nitrosopyrrolidine	930-55-2	Pyrrolidine, 1-nitroso-	8270	10
5-Nitro-o-toluidine	99-55-8	Benzenamine, 2-methyl-5-nitro-	8270	10
Parathion	56-38-2	Phosphorothioic acid, O,O-diethyl-O-(4-nitrophenyl) ester	8270	10
Polychlorinated biphenyls; PCBs	See Note 7	1,1'-Biphenyl, chloro derivatives	8080	50
			8250	100
Polychlorinated dibenzo-p-dioxins; PCDDs	See Note 8	Dibenzo[b,e][1,4]dioxin, chloro derivatives	8280	0.01
Polychlorinated dibenzofurans; PCDFs	See Note 9	Dibenzofuran, chloro derivatives	8280	0.01
Pentachlorobenzene	608-93-5	Benzene, pentachloro-	8270	10
Pentachloroethane	76-01-7	Ethane, pentachloro-	8240	5
			8270	10
Pentachloronitrobenzene	82-68-8	Benzene, pentachloronitro-	8270	10
Pentachlorophenol	87-86-5	Phenol, pentachloro-	8040	5
			8270	50
Phenacetin	62-44-2	Acetamide, N-(4-ethoxyphenyl)	8270	10
Phenanthrene	85-01-8	Phenanthrene	8100	200
			8270	10
Phenol	108-95-2	Phenol	8040	1
			8270	10
p-Phenylenediamine	106-50-3	1,4-Benzenediamine	8270	10
Phorate	298-02-2	Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl] ester	8140	2
			8270	10
2-Picoline	109-06-8	Pyridine, 2-methyl-	8240	5
			8270	10
Pronamide	23950-58-5	Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2-propynyl)-	8270	10
Propionitrile; Ethyl cyanide	107-12-0	Propanenitrile	8015	60
			8240	5
[illegible]ene	129-00-0	Pyrene	8100	200
			8270	10
[illegible]dine	110-86-1	Pyridine	8240	5
			8270	10

APPENDIX IX—GROUND-WATER MONITORING LIST [1]—Continued

Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	PQL (µg/L) [6]
Safrole	94–59–7	1,3-Benzodioxole, 5-(2-propenyl)-	8270	10
Selenium	(Total)	Selenium	6010	750
			7740	20
			7741	20
Silver	(Total)	Silver	6010	70
			7760	100
Silvex; 2,4,5-TP	93–72–1	Propanoic acid, 2-(2,4,5-trichlorophenoxy)-	8150	2
Styrene	100–42–5	Benzene, ethenyl-	8020	1
			8240	5
Sulfide	18496–25–8	Sulfide	9030	10,000
2,4,5-T; 2,4,5-Trichlorophenoxyacetic acid	93–76–5	Acetic acid, (2,4,5-trichlorophenoxy)-	8150	2
2,3,7,8-TCDD; 2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746–01–6	Dibenzo[b,e][1,4]dioxin, 2,3,7,8-tetrachloro-	8280	0.005
1,2,4,5-Tetrachlorobenzene	95–94–3	Benzene, 1,2,4,5-tetrachloro-	8270	10
1,1,1,2-Tetrachloroethane	630–20–6	Ethane, 1,1,1,2-tetrachloro-	8010	5
			8240	5
1,1,2,2-Tetrachloroethane	79–34–5	Ethane, 1,1,2,2-tetrachloro-	8010	0.5
			8240	5
Tetrachloroethylene; Perchloroethylene; Tetrachloroethene	127–18–4	Ethene, tetrachloro-	8010	0.5
			8240	5
2,3,4,6-Tetrachlorophenol	58–90–2	Phenol, 2,3,4,6-tetrachloro-	8270	10
Tetraethyl dithiopyrophosphate; Sulfotepp	3689–24–5	Thiodiphosphoric acid ([(HO)$_2$P(S)]$_2$O), tetraethyl ester	8270	10
Thallium	(Total)	Thallium	6010	400
			7840	1,000
			7841	10
Tin	(Total)	Tin	7870	8,000
• Toluene	108–88–3	Benzene, methyl-	8020	2
			8240	5
o-Toluidine	95–53–4	Benzenamine, 2-methyl-	8270	10
Toxaphene	8001–35–2	Toxaphene	8080	2
			8250	10
1,2,4-Trichlorobenzene	120–82–1	Benzene, 1,2,4-trichloro-	8270	10
1,1,1-Trichloroethane; Methylchloroform	71–55–6	Ethane, 1,1,1-trichloro-	8240	5
1,1,2-Trichloroethane	79–00–5	Ethane, 1,1,2-trichloro-	8010	0.2
			8240	5
Trichloroethylene; Trichloroethene	79–01–6	Ethene, trichloro-	8010	1
			8240	5
Trichlorofluoromethane	75–69–4	Methane, trichlorofluoro-	8010	10
			8240	5
2,4,5-Trichlorophenol	95–95–4	Phenol, 2,4,5-trichloro-	8270	10
2,4,6-Trichlorophenol	88–06–2	Phenol, 2,4,6-trichloro-	8040	5
			8270	10
1,2,3-Trichloropropane	96–18–4	Propane, 1,2,3-trichloro-	8010	10
			8240	5
O,O,O-Triethyl phosphorothioate	126–68–1	Phosphorothioic acid, O,O,O-triethyl ester	8270	10
sym-Trinitrobenzene	99–35–4	Benzene, 1,3,5-trinitro-	8270	10
Vanadium	(Total)	Vanadium	6010	80
			7910	2,000
			7911	40
Vinyl acetate	108–05–4	Acetic acid, ethenyl ester	8240	5
Vinyl chloride	75–01–4	Ethene, chloro-	8010	2
			8240	10
• Xylene (total)	1330–20–7	Benzene, dimethyl-	8020	5
			8240	5
Zinc	(Total)	Zinc	6010	20
			7950	50

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[1] The regulatory requirements pertain only to the list of substances; the right hand columns (Methods and PQL) are given for informational purposes only. See also footnotes 5 and 6.

[2] Common names are those widely used in government regulations, scientific publications, and commerce; synonyms exist for many chemicals.

[3] Chemical Abstracts Service registry number. Where "Total" is entered, all species in the ground water that contain this element are included.

[4] CAS index names are those used in the 9th Cumulative Index.

[5] Suggested Methods refer to analytical procedure numbers used in EPA Report SW-846 "Test Methods for Evaluating Solid Waste", third edition, November 1986. Analytical details can be found in SW-846 and in documentation on file at the agency. CAUTION: The methods listed are representative SW-846 procedures and may not always be the most suitable method(s) for monitoring an analyte under the regulations.

[6] Practical Quantitation Limits (PQLs) are the lowest concentrations of analytes in ground waters that can be reliably determined within specified limits of precision and accuracy by the indicated methods under routine laboratory operating conditions. The PQLs listed are generally

s [4] to one significant figure. CAUTION: The PQL values in many cases are based only on a general estimate for the method and not on a c ination for individual compounds; PQLs are not a part of the regulation.

Polychlorinated biphenyls (CAS RN 1336-36-3); this category contains congener chemicals, including constituents of Aroclor-1016 (CAS RN 4-11-2), Aroclor-1221 (CAS RN 11104-28-2), Aroclor-1232 (CAS RN 11141-16-5), Aroclor-1242 (CAS RN 53469-21-9), Aroclor-1248 (CAS .2672-29-6), Aroclor-1254 (CAS RN 11097-69-1), and Aroclor-1260 (CAS RN 11096-82-5). The PQL shown is an average value for PCB congeners.

[8] This category contains congener chemicals, including tetrachlorodibenzo-p-dioxins (see also 2,3,7,8-TCDD), pentachlorodibenzo-p-dioxins, and hexachlorodibenzo-p-dioxins. The PQL shown is an average value for PCDD congeners.

[9] This category contains congener chemicals, including tetrachlorodibenzofurans, pentachlorodibenzofurans, and hexachlorodibenzofurans. The PQL shown is an average value for PCDF congeners.

PART 270—AMENDED

1. The authority citation for Part 270 is revised to read as follows:

Authority: Secs. 1006, 2002(a), 3001, 3004, and 3005, of the Solid Waste Disposal Act, as amended, 42 U.S.C. 6905, 6912(a), 6924 and 6925.

2. Section 270.14 is amended by revising paragraph (c)(4)(ii) to read as follows:

§ 270.14 Contents of Part B: general requirements.

* * * * *

(c) * * *

(4) * * *

(ii) Identifies the concentration of each Appendix IX, of Part 264 of this chapter, constituent throughout the plume or identifies the maximum concentrations of each Appendix IX constituent in the plume.

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ATTACHMENT IV.11

MAXIMUM CONCENTRATION OF CONSTITUENTS FOR GROUNDWATER PROTECTION

Constituent	Maximum Concentration (MCL) *
Arsenic	0.05
Barium	1.00
Cadmium	0.01
Chromium	0.05
Lead	0.05
Mercury	0.002
Selenium	0.01
Silver	0.05
Endrin (1,2,3,4,10,10-hexachloro-1,7-epoxy-1,4,4a,5,6,7,8,9a-octaydro-1, 4-endo, endo-5,8-dimenthano naphthalene)	0.0002
Lindane (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer)	0.004
Methoxychlor (1,1,1-Trichloro-2,2-bis (p-methoxyphenylethane)	0.1
Toxaphene ($C_{10}H_{10}Cl_6$, Technical chlorinated camphene, 67-69 percent chlorine)	0.005
2,4-D (2,4-Dichlorophenoxyacetic acid)	0.1
2,4,5-TP Silvex (2,4,5-Trichlorophenoxypropionic acid)	0.01

* Milligrams per liter

MODULE V

CLOSURE/POST-CLOSURE

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MODULE V -- CLOSURE/POST-CLOSURE

A. APPLICABILITY

1. The requirements of this module shall pertain to the following regulated units at the facility as defined in Condition II.A. of the Permit:

    a. South Land Treatment Unit
    b. New East and Old East Land Treatment Unit
    c. Waste Staging Area
    d. TEL Lead Weathering Treatment Tank

2. Facility closure shall commence:

    a. Upon direction of the Department for violation of the permit, ARM Rules or state statutes;

    b. Upon suspension, cancellation, or revocation of the terms and conditions of this permit concerning the authorization to store or treat waste materials;

    c. Upon abandonment of the site;

    d. Upon direction of the Department for failure to secure and maintain adequate financial assurance as required in Condition V.N.; or

    e. When necessary to comply with Conditions III.a.O., III.b.L., and III.c.L.

B. CLOSURE PERFORMANCE STANDARD

The Permittee shall close a regulated unit in a manner that:

1. Minimizes the need for further maintenance; and

2. Controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere; and

3. Complies with the closure requirements of this Module including, but not limited to, requirements specified in Conditions III.a.O, III.b.L., III.c.L., and IV.H. of this permit.

C. AMENDMENT OF PLAN

The Permittee shall submit a written request in compliance with ARM 16.44.116 for a permit modification to authorize a change in operating plans, facility design, or the approved closure plan in accordance with the procedures in Title 16, Chapter 44, Subchapters 1 and 9, ARM. The written request shall include a copy of the amended closure and/or post-closure care plans for approval by the Department.

1. The Permittee may submit a written request to the Department for a permit modification to amend the closure and/or post-closure plans at any time prior to the notification of partial or final closure of the facility.

2. The Permittee shall submit a written request for a permit modification to authorize a change in the approved closure and/or post-closure plans whenever:

a. Changes in operating plans or facility design affect the closure and/or post-closure plans;

b. There is a change in the expected year of closure, if applicable;

c. In conducting partial or final closure activities, unexpected events require a modification of the approved closure plan;

d. Events occur during the active life of the facility, including partial and final closures, which affect the approved post-closure plan; or

e. Requested by the Department under the conditions described in Conditions V a-d above.

3. The Permittee shall submit a written request for a permit modification including a copy of the amended closure plan and revised cost estimates as required under Condition V.M.2. for approval at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the closure plan. If an unexpected event occurs during the partial or final closure period, the Permittee shall request a permit modification no later than 30 days after the unexpected event. The Department will approve, disapprove, or modify this amended plan in accordance with the procedures in Title 16, Chapter 44, Subchapters 1 and 9, ARM. The approved closure plan will become a condition of this Permit.

4. The Department may request modifications to the plan under the conditions described under C.2. of this Module. The Permittee shall submit the modified plan within 60 days of the Department's request, or within 30 days if the change in

facility conditions occurs during partial or final closure. Any modifications requested by the Department will be approved in accordance with the procedures in Title 16, Chapter 44, Subchapters 1 and 9, ARM.

D. NOTIFICATION OF PARTIAL CLOSURE AND FINAL CLOSURE

1. The Permittee shall notify the Department in writing at least 60 days prior to the date on which he expects to begin closure of a land treatment unit, or final closure of a facility with such a unit. The Permittee shall notify the Department in writing at least 45 days prior to the date on which he expects to begin final closure of the TEL lead weathering treatment tank or the waste staging area.

2. The date when the Permittee "expects to begin closure" shall be either no later than 30 days after the date on which any hazardous waste management unit receives the known final volume of hazardous wastes or, if there is a reasonable possibility that the hazardous waste management unit will receive additional hazardous waste, no later than one year after the date on which the unit received the most recent volume of hazardous waste. If the Permittee can demonstrate to the Department that the hazardous waste management unit has the capacity to receive additional hazardous wastes and the Permittee has taken, and will continue to take, all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements in Modules III.a, III.b., III.c., and IV, the Department may approve an extension to this one-year limit.

3. If this facility's permit is terminated, or if the Permittee is otherwise ordered, by judicial decree or final order under 75-10-413, MCA, to cease receiving hazardous wastes or to close, then the requirements of this paragraph do not apply. However, the Permittee shall close the facility in accordance with the deadlines established in Condition F of this Module.

E. REMOVAL OF WASTES AND DECONTAMINATION OR DISMANTLING OF EQUIPMENT

Nothing in this Module shall preclude the Permittee from removing hazardous wastes and decontaminating or dismantling equipment in accordance with the approved partial or final closure plan at any time before or after notification of partial or final closure.

F. CLOSURE SCHEDULE

1. Within 90 days after receiving the final volume of hazardous wastes at the TEL Lead Weathering Tank or Waste Staging Area, the Permittee shall remove from the unit all hazardous wastes in accordance with the approved closure plans in Modules III.b. and III.c. The Department may approve a longer period if the Permittee complies with all applicable requirements for requesting a modification to the permit and demonstrates that:

    a. The activities required to comply with this paragraph will, of necessity, take longer than 90 days to complete; or

    b. i. The hazardous waste management unit has the capacity to receive additional hazardous wastes; and

       ii. There is a reasonable likelihood that he or another person will recommence operation of the hazardous waste management unit within one year; and

iii. Closure of the hazardous waste management unit would be incompatible with continued operation of the site; and

c. The Permittee has taken and will continue to take all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements.

2. The Permittee must complete final closure activities for the TEL lead weathering tank in accordance with the conditions outlined in Module III.b. and within 270 days after receiving the final volume of hazardous waste.

3. The Permittee shall complete closure activities for the containerized storage area in accordance with the approved closure plan as outlined in Modules IIIc of this Permit, and within 180 days after receiving the final volume of hazardous wastes at the hazardous waste management unit.

4. The Permittee must complete final closure activities for the land treatment areas in accordance with Conditions III.a.0. and IV.I. of this Permit.

5. The Department may approve an extension to the closure period for any hazardous waste management unit if the Permittee complies with all applicable requirements for requesting a modification to the Permit and demonstrates that:

   a. The partial or final closure activities will, of necessity, take longer than the time period stipulated in this Permit to complete; or

b. i. The hazardous waste management unit has the capacity to receive additional hazardous wastes; and

ii. There is reasonable likelihood that the Permittee will recommence operation of the hazardous waste management unit within one year; and

iii. Closure of the hazardous waste management unit would be incompatible with continued operation of the site; and

c. The Permittee has taken and will continue to take all steps to prevent threats to human health and the environment from the unclosed but not operating hazardous waste management unit, including compliance with all applicable permit requirements.

6. The demonstrations referred to in Conditions F.1. through 5. of this Module, shall be made as follows: (a) The demonstrations in paragraph 1 shall be made at least 30 days prior to the expiration of the 90-day period in paragraph 1; and (b) the demonstrations in paragraphs 2 through 5 shall be made at least 30 days prior to the expiration of the closure period stipulated in paragraphs 2 through 4 of this section.

G. DISPOSAL OR DECONTAMINATION OF EQUIPMENT, STRUCTURES AND SOILS

During the closure periods, all contaminated equipment, structures, and soils shall be properly disposed of or decontaminated, unless otherwise specified in Modules IIIa., III.b., or III.c. By removing any hazardous wastes or hazardous constituents during closure, the Permittee may become a generator of hazardous waste and shall handle that waste in accordance with all applicable requirements of Title 16, Chapter 44, Subchapter 4.

H. CERTIFICATION OF CLOSURE

Within 60 days of completion of closure of each hazardous waste management unit identified in Condition II.A. the Permittee shall submit to the Department, by registered mail, a certification that the hazardous waste management unit has been closed in accordance with the specification in the approved closure plan. The certification shall be signed by the Permittee and by an independent registered professional engineer, or if the hazardous waste management unit is a land treatment unit, the certification may be signed by an independent qualified professional soils scientist. Documentation supporting the independent registered professional engineer's certification shall be furnished to the Department upon request until the Permittee is released from the financial assurance requirements for closure under Condition N. of this Module. Documentation supporting a "qualified" soils scientist shall be in accordance with criteria set by the Department.

I. SURVEY PLAT

No later than the submission of the certification of closure of each hazardous waste land treatment unit, the Permittee shall submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Department, a survey plat indicating the location and dimension of each land treatment unit with respect to permanently surveyed benchmarks. This plat shall be prepared and certified by a professional land surveyor. The plat filed with the local zoning authority, or the authority with jurisdiction over local land use, shall contain a note prominently displayed, which states the Permittee's obligation to restrict disturbance of the hazardous waste disposal unit in accordance with Condition III.a.I.

J. POST-CLOSURE CARE AND USE OF PROPERTY

1. a. Post-closure care for each hazardous waste land treatment unit shall begin after completion of closure of the unit and continue for 30 years after that date and shall consist of the monitoring and reporting in accordance with the requirements specified in Modules III.a. and IV. of this Permit, and

   b. Any time preceding partial closure of a hazardous waste management unit subject to post-closure care requirements or final closure, or any time during the post-closure period for a particular unit, the Department may, in accordance with the permit modification procedures in Title 16, Chapter 44, Subchapters 1 and 9, ARM.

      i. Shorten the post-closure care period applicable to the hazardous waste management unit if all disposal units have been closed if the Department finds that the reduced period is sufficient to protect human health and the environment (e.g., leachate or groundwater monitoring results, characteristics of the hazardous wastes, application of advanced technology, or alternative disposal, treatment, or re-use techniques indicate that the hazardous waste management unit is secure); or

      ii. Extend the post-closure care period applicable to the hazardous waste management unit if the Department finds that the extended period is necessary to protect human health and the environment (e.g., leachate or ground-water monitoring results indicate a potential for migration of hazardous wastes at levels which may be harmful to human health and the environment.)

2. The Department may require, at partial and final closure, continuation of any of the security requirements of Condition II.D. in this Permit during part or all of the post-closure period when:

   a. Hazardous wastes may remain exposed after completion of partial or final closure; or

   b. Access by the public or domestic livestock may pose a hazard to human health.

3. Post-closure use of property on or in which hazardous wastes remain after partial or final closure shall never be allowed to disturb the integrity of the final cover or any other components of the containment system, or the function of the unit's monitoring systems, unless the Department finds that the disturbance:

   a. Is necessary to the proposed use of the property, and will not increase the potential hazard to human health or the environment; or

   b. Is necessary to reduce a threat to human health or the environment.

4. All post-closure care activities shall be in accordance with the provisions of the approved post-closure plan as specified in Conditions III.a.o, IV.H. and V.K. of this Permit.

K. POST-CLOSURE PLAN

1. Written Plan

   a. The Permittee must comply with the Post-closure plan outlined in Conditions III.a.0. and IV.H of this Permit.

   b. Personnel in the Environmental Section identified in Section 11.1.8 (Attachment V.1) of the Application shall be the contact about the hazardous waste disposal unit or facility during the post-closure care period.

2. Until final closure of each land treatment unit, a copy of the approved post-closure plan shall be furnished to the Department upon request, including request by mail. After final closure has been certified, the office specified in Condition V.K.1.b. shall keep the approved post-closure plan during the remainder of the post-closure period.

3. Amendment of plan

   The Permittee may request a permit modification in compliance with ARM 16.44.6 to authorize a change in the approved post-closure plan in accordance with the applicable requirements of Title 16, Chapter 44, Subchapters 1 and 9. The written request shall include a copy of the amended post-closure plan for approval by the Department.

   a. The Permittee may submit a written request to the Department for a permit modification to amend the post-closure plan at any time during the active life of the facility or during the post-closure care period.

   b. The Permittee shall submit a written request for a permit modification to authorize a change in the approved post-closure plan whenever:

      i. Changes in operating plans or facility design affect the approved post-closure plan, or

      ii. There is a change in the expected year of final

closure, if applicable, or

iii. Events which occur during the active life of the facility, including partial and final closures, affect the approved post-closure plan.

c. The Permittee shall submit a written request for a permit modification at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the post-closure plan.

d. The Department may request modifications to the plan under Conditions K.3.b. of this Module. The Permittee shall submit the modified plan no later than 90 days after the Department's request. Any modifications requested by the Department will be approved, disapproved, or modified in accordance with the procedures in Title 16, Chapter 44, ARM.

L. POST-CLOSURE NOTICES

1. No later than 60 days after certification of closure of each hazardous waste land treatment unit, the Permittee shall submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Department a record of the type, location, and quantity of hazardous wastes disposed of within each cell or other disposal unit of the facility. For hazardous wastes disposed of before January 12, 1981, the Permittee shall identify the type, location, and quantity of the hazardous wastes to the best of his/her knowledge and in accordance with any records he/she has kept.

2. Within 60 days of certification of closure of the first hazardous waste disposal unit and within 60 days of certification of closure of the last hazardous waste disposal

unit, the Permittee must:

a. Record a notation on the deed to the facility property that will in perpetuity notify any potential purchaser of the property that:

   i. The land has been used to manage hazardous wastes; and

   ii. Its use is restricted under Condition III.a.I and III.a.0 of the Permit; and

   iii. The survey plat and record of the type, location, and quantity of hazardous wastes disposed of within each cell or other hazardous waste disposal unit of the facility required by Condition I and L.1. of this Module have been filed with the local zoning authority or the authority with jurisdiction over local land use and with the Department; and

b. Submit a certification, signed by the Permittee, that he or she has recorded the notation specified in paragraph I of this Module, including a copy of the document in which the notation has been placed, to the Department.

3. If the Permittee or any subsequent Permittee of the land upon which a hazardous waste disposal unit is located wishes to remove hazardous wastes, hazardous waste residues, or contaminated soils, he or she shall request a modification to the post-closure permit in accordance with the applicable requirements in Title 16, Chapter 44, Subchapters 1 and 9, ARM. The Permittee shall demonstrate that the removal of hazardous wastes will satisfy the criteria of Condition J.3. of this Module. By removing hazardous waste, the Permittee may become a generator of hazardous waste and shall manage it in accordance with all applicable requirements of ARM 16.44

Subchapter 4. If the Permittee is granted a permit modification or otherwise granted approval to conduct such removal activities, the Permittee may request that the Department approve either:

a. The removal of the notation on the deed to the facility property or other instrument normally examined during title search; or

b. The addition of a notation to the deed or instrument indicating the removal of the hazardous waste.

M. COST ESTIMATE FOR CLOSURE AND POST-CLOSURE CARE

1. The Permittee must adjust the closure and post-closure care cost estimate in Section 11.5 of the Application (Attachment V.2.), for inflation within 30 days after the close of the fiscal year for Exxon Corporation as identified in Attachment V.3. This annual inflation adjustment shall:

   a. be subject to the permit modification requirements of ARM 16.44.118;

   b. be calculated using the procedure outlined in 40 CFR 264.142(b) as incorporated by reference in ARM 16.44.702.

2. The Permittee must revise the closure or post-closure care cost estimate no later than 30 days after the Department has approved a request to modify the closure or post-closure care plan respectively. This condition is subject to the permit modification requirements of Condition V.C. and ARM 16.44.116. The revised closure or post-closure care cost estimate must be adjusted for inflation as specified in Condition V.M.

3. The Permittee must keep at the facility the latest closure and post-closure care cost estimate.

N. FINANCIAL ASSURANCE FOR CLOSURE/POST-CLOSURE

The Permittee shall demonstrate continuous compliance with ARM 16.44.815 by providing documentation of financial assurance, as required by ARM 16.44.823 in at least the amount of the cost estimates required by permit Condition V.M. Changes in the financial assurance mechanism must be approved by the Department.

Attachments
Module V
Closure/Post-Closure

List of Attachments
Module V -- Closure/Post-Closure

Attachment V.1.	Post-Closure Care Facility Contact
Attachment V.2.	Closure and Post-Closure Cost Estimate
Attachment V.3.	Letter Identifying the Holder of Financial Responsibility

ATTACHMENT V.1.
POST-CLOSURE CARE FACILITY
CONTACT

11.1.8 Location, Copies, and Update of Closure Plan

Copies of the closure plan will be located in the following areas:

1. Process Department Head - one copy
2. Environmental Coordinator - one copy
3. Environmental Engineer -one copy
4. Process Engineering Division - two copies

The Environmental Engineer in the Environmental Section will be responsible for updating the facility/post closure plans. This individual is the key contact during the post-closure period. At the present time, the Environmental Engineer is Mr. David DeBats (phone (406) 657-5343) who is located at the Exxon Refinery, Billings, Montana. In accordance with 264.112(b) and 124.5(a), the owner or operator may amend the closure plan whenever changes in operating plans or facility design affects the closure plan, or whenever there is a change in the expected year of closure.

When substantial changes in the facilities' operations require the updating of the closure plan, the Environmnetal Engineer will update the plan and send copies of the updated plan to all persons who have copies of the plan. This is the same procedure that is used to update the SPCC plan.

ATTACHMENT V.2.

11.5 CLOSURE AND POST CLOSURE COST ESTIMATE

11.5.1 Closure Cost Estimate

Closure costs for the HWM units covered in this permit include the Lead Weathering tank, the Waste Staging Area and the two land treatment areas.

	1986 Cost
+ Lead Weathering Tank	
• Remove residue	$ 5,900
• Decontaminate	1,200
• Testing	100
• Disposal	5,300
• Dismantling	12,900
• Leveling, revegetate	6,500
Total	$31,800
+ Waste Staging Area	
• Prepare wastes for shipment	$ 3,800
• Shipment and disposal cost	58,900
• Testing	200
• Decontaminae equipment, remove any hazardous waste residue	16,900
Total	$79,800
+ Land Treatment Units	
• Operation for one year after receiving the last load of waste	$152,500
• Sampling	68,200
• Lime/fertilizer addition	24,200
• Topsoil cover	282,000
Total	$526,900

Total closure cost of all HWM facilities assuming the maximum inventory of waste onsite would be as follows:

	1986 Cost, k$
Lead Weathering tank	31.8
Waste Staging area	79.8
Land Treatment units	526.9
Total	638.5
30% Contingency	191.5
	830.0

11.5.2 Post-Closure Cost Estimate

As can be seen from the closure plan, only the land treatment units will have costs associated with post-closure activities. The basis for our post-closure cost estimate is as follows:

1. Assume 1 major maintenance repair a year:

• 1 major piece of equipment for 1 week: (40 hrs) ($100/hr)	$ 4,400
• 1 man-month labor (20 days) (8 hrs/day) ($30/hr)	5,300
• 30% Contingency	3,000
• Total Maintenance Cost	$12,700

2. Soil Core Monitoring on a geometric progression basis of six months, one year, years two, four, eight, sixteen and thirty.

- Sampling number
  (4 cores/land treatment sub-area)(4 sub-areas) = 16 corings per time.

- Sampling cost - $50/core = $900/sampling

- Analytical costs for PHC's:

Organics		$ 465/sample
Metals		$ 60/sample
Phenols		$ 40/sample
Hydrogen Sulfide		$ 100/sample
Total $665	=	$10,640/sampling

- 30% contingency added to first sampling period

Sampling	$ 900
Analysis	10,640
	$11,540
30% contingency	3,460
Toal sampling per period	$15,000

3. Soil pH/nutrient monitoring once every 5 years

- Sample number
  (4 samples each South and East land treatment areas)

- Analytical costs
  pH = $12/sample
  Nutrients = $10/sample
  Total = $22/sample Say $25 = $200/sampling

4. Ground Water Monitoring based on semi-annual sampling

- Sample number (2 Land Treatment Areas)(4 wells/area) = 8 wells one sample per well
- Sampling cost = $112/well @ 8 wells = $900/sampling
- Analytical Cost = $200/sampling
  TOC = $25/sample
- Total Cost per year = $2200/yr
- 30% Contingency = $ 600/yr
- Total yearly cost = $2800/yr

5. Total Post-Closure Care Cost for 30 years

- Maintenance ($12700/yr)(30 years) = $381,000
- Soil Core Monitoring = $105,000

Year	
1	30,000
2	15,000
4	15,000
8	15,000
16	15,000
30	15,000

- Soil pH/nutrient = $ 1,200

Year	
5	200
10	200
15	200
20	200
25	200
30	200

- Ground Water Monitoring ($2800/yr)(30 years) = $ 84,000
- Total $570,000

ATTACHMENT V.3.

EXXON CORPORATION

1251 AVENUE OF THE AMERICAS, NEW YORK, N.Y. 10020-1198

EDGAR A. [illegible]
[illegible] President and Treasurer
D. STEVE
Deputy Treasurer
W. D. [illegible]
W. A. HARRISON
C. W. WILLIAMS
Assistant Treasurers

April 23, 1987

Mr. Duane L. Robertson, Chief
Solid Waste Management Bureau
Environmental Sciences Division
Cogswell Building, Room B201
Helena, Montana 59620

Dear Mr. Robertson:

I am the chief financial officer of Exxon Corporation located at 1251 Avenue of the Americas, New York, New York 10020. This letter is in support of the use of the financial test to demonstrate financial responsibility for liability coverage and closure and post-closure care as specified in Subpart H of 40 CFR Parts 264 and 265.

The firm identified above is the owner or operator of the following facilities for which liability coverage for both sudden and nonsudden accidental occurrences is being demonstrated through the financial test specified in Subpart H of 40 CFR Parts 264 and 265: all facilities listed in paragraph (3) below.

1. The firm identified above owns or operates the following facilities for which financial assurance for closure or post-closure care is demonstrated through the financial test specified in Subpart H of 40 CFR Parts 264 and 265. The current closure and/or post-closure cost estimates covered by the test are shown for each facility: none.

2. The firm identified above guarantees, through the corporate guarantee specified in Subpart H of 40 CFR Parts 264 and 265, the closure and post-closure care of the following facilities owned or operated by its subsidiaries. The current cost estimates for the closure or post-closure care so guaranteed are shown for each facility:

   a. Facilities at Exxon Research & Engineering Company's Baytown, Texas Research Facility

      - Exxon Research & Engineering Co., Baytown
        4500 Bayway Drive
        Baytown, Texas 77520
        (M. A. Burns - Environmental Coordinator)

      - EPA Identification Number: TXD040314338

      - Closure Cost Estimate: $22,572

      - Post-closure Cost Estimate: -0-

3. In States where EPA is not administering the financial requirements of Subpart H of 40 CFR Parts 264 and 265, this firm is demonstrating financial assurance for the closure or post-closure care of the following facilities through the use of a test equivalent or substantially equivalent to the financial test specified in Subpart H of 40 CFR Parts 264 and 265. The current closure and post-closure cost estimates covered by such a test are shown for each facility:

a. Facilities at Exxon Company, U.S.A.'s Baytown, Texas Refinery

- Exxon Company, U.S.A., Baytown Refinery
  P. O. Box 3950
  Baytown, Texas 77522-3950
  (J. M. Blackwelder - Supervisor Environmental Section)

- EPA Identification Number: TXD 000782698

- Closure Cost Estimate: $4,462,000

- Post-closure Cost Estimate: $1,976,700

b. Facilities at Exxon Company, U.S.A.'s Baton Rouge, Louisiana Refinery

- Exxon Company, U.S.A., Baton Rouge Refinery
  P. O. Box 551
  Baton Rouge, Louisiana 70821
  (L. Kronenberger - Environmental Coordinator)

- EPA Identification Number: LAD062662887

- Closure Cost Estimate: $3,099,897

- Post-closure Cost Estimate: $1,757,325

c. Facilities at Exxon Company, U.S.A's Billings, Montana Refinery

- Exxon Company, U.S.A., Billings Refinery
  P. O. Box 1163
  Billings, Montana 59103
  (T. N. Schug - Environmental Coordinator)

- EPA Identification Number: MTD010380574

- Closure Cost Estimate: $830,000

- Post-closure Cost Estimate: $570,000

d. Facilities at Exxon Chemical Americas, Houston Chemical Plant

- Exxon Chemical Americas, Houston Chemical Plant
  8230 Stedman St.
  Houston, Texas 77029
  (R. J. Greer - Supervisor Environmental Section)

- EPA Identification Number: TXD082684002

- Closure Cost Estimate: $1,128,289

- Post-closure Cost Estimate: -0-

4. The firm identified above owns or operates the following hazardous waste management facilities for which financial assurance for closure or, if a disposal facility, post-closure care, is not demonstrated either to EPA or a State through the financial test or any other financial assurance mechanism specified in Subpart H of 40 CFR Parts 264 and 265 or equivalent or substantially equivalent State mechanisms. The current closure and/or post-closure cost estimates not covered by such financial assurance are shown for each facility: none

5. This firm is the owner or operator of the following UIC facilities for which financial assurance for plugging and abandonment is required under Part 144. The current closure cost estimates as required by 40 CFR 144.62 are shown for each facility: none

This firm is required to file a Form 10-K with the Securities and Exchange Commission (SEC) for the latest fiscal year.

The fiscal year of this firm ends on December 31. The figures for the following items marked with an asterisk are derived from this firm's independently audited, year-end financial statements for the latest completed fiscal year, ended December 31, 1986.

1.	Sum of current closure and post-closure cost estimates (total of all cost estimates listed above)	$ 13,846,783
2.	Amount of annual aggregate liability coverage to be demonstrated	$ 8,000,000
3.	Sum of lines 1 and 2	$ 21,846,783
4.	Current bond rating of most recent issuance and name of rating service	AAA Standard & Poor's
5.	Date of issuance of bond	July 11, 1968

6. Date of maturity of bond July 15, 1998

*7. Tangible net worth (if any portion of the closure or post-closure cost estimates is included in "total liabilities" on your financial statements you may add that portion to this line) $31,928,000,000

*8. Total assets in the U.S. (required only if less than 90% of assets are located in the U.S.) $26,095,000,000

		YES	NO
9.	Is line 7 at least $10 million?	X	
10.	Is line 7 at least 6 times line 3?	X	
11.	Are at least 90% of assets located in the U.S.? If not, complete line 12.		X
12.	Is line 8 at least 6 times line 3?	X	

I hereby certify that the wording of this letter is identical to the wording specified in 40 CFR 264.151(g) as such regulations were constituted on the date shown immediately below.

April 23, 1987

Edgar A. Robinson
Vice President and Treasurer

FORM
APPROVED

Attachments

Module VI --Special Conditions

Treatment Zone Separation Demonstration

List of Attachments
Module VI -- Special Conditions

VI1	New East Landfarm PHC Sampling
VI2	Land Treatment Separation Investigation

ATTACHMENT VI 1

LSE

MEMORANDUM
8-4-88-01

TO: T.N. SCHUG

FROM: PAUL LEMIRE, LSE

DATE: AUGUST 4, 1988

SUBJECT: NEW EAST LANDFARM PHC SAMPLING

On July 29 and August 1, 1988 five (5) soil samples were collected on the New East Landfarm (NELF) and sent to Rocky Mountain Analytical Laboratories in Arvada, Colorado for analysis of principal hazardous constituents (PHC). One soil sample each was collected in the following landfarm sectors: 26, 27, 32, 33 and 38. Soil sample locations are shown in Figure 1 and designated with a "NELFBTZ" label. Each sample was collected at a depth equal to the bottom of the treatment zone. Treatment zone bottom for sectors 26 and 27 is defined by Exxon at four (4) feet below ground surface and for sectors 32, 33 and 38 is three (3) feet below ground surface.

The soil samples were collected in the following manner:

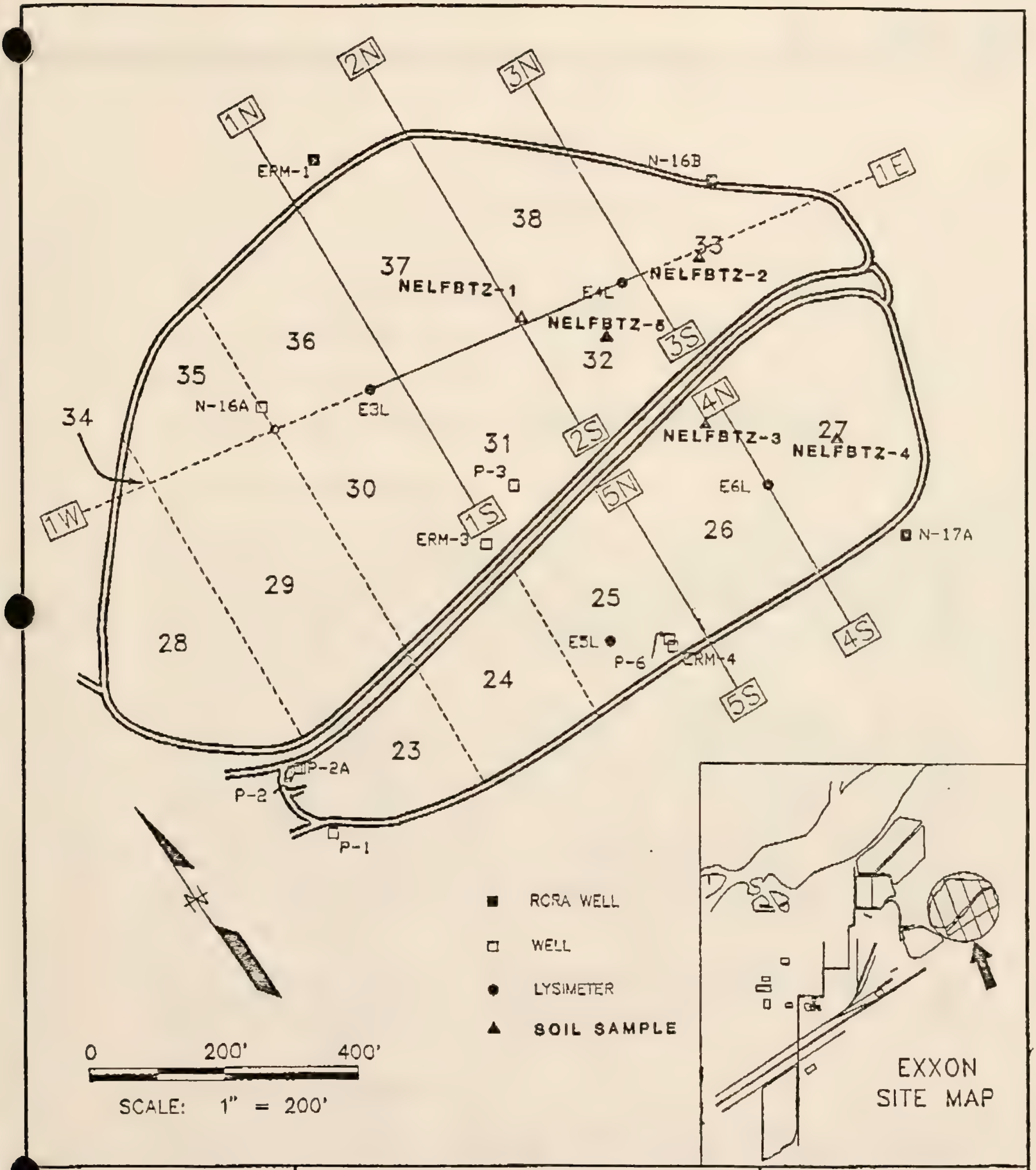
- o Drill to top of selected sample depth with 3.25-inch I.D. hollow stem augers. Top of sample depth for sectors 26 and 27 is 3.5 feet; top of sample depth for sectors 32, 33 and 38 is 2.5 feet.
- o Collect soil sample with a 3-inch diameter by 12-inch long thin-walled stainless steel sampler (Shelby tube). The Shelby tube was pushed 12 inches from the top of the selected sample depth.
- o After removing Shelby tube from borehole, both ends of tube were sealed with teflon/rubber gasket plugs.
- o Shelby tubes were labeled with sample site number, date, time of collection and sampler's name. All information was recorded on a chain-of-custody form.

All Shelby tube soil samples were shipped the same day via Federal Express carrier to Rocky Mountain Analytical. The laboratory was instructed to analyze for the following PHC constituents: Skinner list volatile organics, semi-volatile organics and metals.

Two (2) additional soil samples are to be collected from the bottom of the treatment zone in landfarm sectors 31 and 37 on August 5, 1988. Collection methods and laboratory analysis will be similar to the previous treatment zone sampling. Locations of these soil samples will be random in each sector.

Laboratory analytical results should be received by August 24, 1988.

VI 1 cont'd.



NEW EAST LANDFARM
BELOW TREATMENT ZONE
SAMPLE SITES

FIGURE
1

MEMORANDUM
8-2-88-01

REVISION 1

TO: T.N. SCHUG, EXXON

FROM: PAUL LEMIRE, LSE

DATE: AUGUST 2, 1988

SUBJECT: LAND TREATMENT SEPARATION INVESTIGATION

Purpose and Objective

The purpose of this investigation is to (1) expand the hydrogeologic characterization in the Exxon New East Landfarm (NELF) vicinity, (2) determine the degree of separation between the uppermost aquifer saturated zone and the bottom of the land application treatment zone and (3) determine the interaction of the uppermost clay aquifer to the underlying sand and gravel aquifer.

This investigation is conducted to satisfy these specific requirements pertaining to aquifer identification (40 CFR 270.14(c)(2) and 264.271(c)(2)), seasonal high water table (40 CFR 264.271(c)(2), and treatment zone dimensions (40 CFR 270.20(b)(5) and 264.271(c)) for a hazardous waste treatment/storage/disposal permit to land treat hazardous waste. Specifically this investigation is in response to the following items in the State of Montana Notice of Deficiencies (NOD) for the Exxon Billings Landfarm Part B: D-7d - Treatment Zone Description; and E-3 Aquifer Identification.

Exxon has established the bottom of the treatment zone at three (3) feet for sectors 31, 32, 33, 37, and 38 and four feet for sectors 25, 26, and 27 (Figure 1).

Investigation Approach

In June 1988 fourteen (14) soil borings and one (1) shallow monitor well were completed at the NELF. These borings (designated by a "P" or "NELFBTZ" label) were drilled to determine the depth to static water level (SWL) and lithology of the soils near and above the SWL. The shallow monitor well (LSE-1) was installed in the uppermost

aquifer and completed in a silty clay unit at a depth of 7.5 feet. This well was established to monitor the SWL in the clay aquifer and determine the interaction of the clay aquifer to the underlying sand and gravel aquifer. Boring and well locations are shown in Figure 1 and completion data in listed in Table 1.

Previous to the June 1988 drilling activity Exxon had completed numerous monitor wells and borings. Locations and completion data are presented in Figure 1 and Table 1. These wells are labeled with the "N" or "ERM" designation. Exxon also installed four (4) pan lysimeters in large 5-foot diameter inverted culverts. The bottom of these culverts are open to the clay unit and backfilled with pea gravel. These lysimeters can therefore be used as piezometers for the shallow clay aquifer. Total depths from ground surface of the lysimeter culvert installations are as follows:

Lysimeter	Total Depth
E3L	6.5 ft
E4L	7.5 ft
E5L	7.4 ft
E6L	9.1 ft

In July and August 1988 three monitor wells and six borings were drilled. Locations and completion data are presented in Figure 1 and Table 1.

Preliminary Results

Five wells (ERM-1, N-16B, N-16A, N-17A, and LSE-2) are completed in the lower sand and gravel aquifer. This sand and gravel aquifer lies at a depth of about 16 to 24 feet below ground surface in the east half of NELF. Seven wells (ERM-2, ERM-3, ERM-4, LSE-1, LSE-3, LSE-4, and N-27) are completed in the upper silty clay unit. Preliminary interpretation of the data indicates that there are two aquifers in the alluvial deposits in the vicinity of the NELF. The uppermost aquifer is a silty clay deposit and the lower aquifer is a sand and gravel deposit. The west half of NELF, containing sectors 23, 24, 28, 29, 30, 34, 35, and 36, is not included in the Part B permit application because of high ground-water levels.

Continuing Investigation

One objective of this investigation is to determine the degree of hydraulic connection between the two aquifers. This will be accomplished by monitoring the SWL in all wells by especially concentrating on the SWL data from the nested pairs of wells: ERM-1 and ERM-2; N-16B and LSE-3; and ERM-4, LSE-1, and LSE-2.

The zone of separation between the SWL of the uppermost aquifer and the bottom of the treatment zone will be determined by examining SWL data from the silty clay aquifer wells and lysimeter pits. Continuous SWL recorders with 30-day charts will be installed on August 4, 1988 on monitor wells: ERM-1 (sand and gravel aquifer), ERM-2 (silty clay aquifer), LSE-1 (silty clay aquifer), LSE-2 (sand and gravel aquifer) and LSE-4 (clay aquifer). SWL will be measured on all wells without recorders at least twice per week through September 1988.

A complete report will be prepared on the hydrogeology at the NELF when more SWL data is received and analyzed.

TABLE 1

EXXON BILLINGS REFINERY
WELL AND BORING COMPLETIONS
IN THE
NEW EAST LANDFARM

WELL/ BORING NUMBER	DATE DRILLED	TOTAL DEPTH	SCREEN LENGTH	UNIT COMPLETION
ERM-1	9/81	22.0	10.0	SAND & GRAVEL
ERM-2	9/81	10.0	6.0	CLAY
ERM-3	9/81	16.0	10.0	CLAY
ERM-4	9/81	13.0	10.0	CLAY
N-16A	11/80	30.5	15.0	SAND & GRAVEL
N-16B	11/80	33.5	15.0	SAND & GRAVEL
N-17A	11/80	42.5	15.0	SAND & GRAVEL
N-27	4/84	10.0	5.0	CLAY
LSE-1	6/88	7.5	2.5	CLAY
LSE-2	7/88	34.5	5.0	SAND & GRAVEL
LSE-3	7/88	8.0	2.5	CLAY
LSE-4	7/88	8.0	2.5	CLAY
P-1	4/84	20.3	3.0	SAND & GRAVEL
P-2	4/84	14.0	6.0	SAND & GRAVEL
P-4	5/84	14.5	0.0	CLAY
P-7	6/88	8.8	0.0	CLAY
P-8	6/88	7.3	0.0	CLAY
P-9	6/88	6.0	0.0	CLAY
P-10	6/88	5.1	0.0	CLAY
P-11	6/88	8.3	0.0	CLAY
P-12	6/88	5.4	0.0	CLAY
P-13	6/88	5.2	0.0	CLAY
P-14	6/88	6.9	0.0	CLAY
P-15	6/88	6.6	0.0	CLAY
P-16	6/88	6.8	0.0	CLAY
P-17	6/88	6.8	0.0	CLAY
P-18	6/88	8.1	0.0	CLAY
P-19	6/88	6.1	0.0	CLAY
P-20	6/88	6.5	0.0	CLAY
P-21	8/88	7.5	0.0	CLAY
NELFBTZ-1	7/88	16.0	0.0	CLAY
NELFBTZ-2	7/88	11.5	0.0	CLAY
NELFBTZ-3	7/88	13.5	0.0	CLAY
NELFBTZ-4	8/88	13.5	0.0	CLAY
NELFBTZ-5	8/88	8.0	0.0	CLAY

Depth and screen length are in feet.

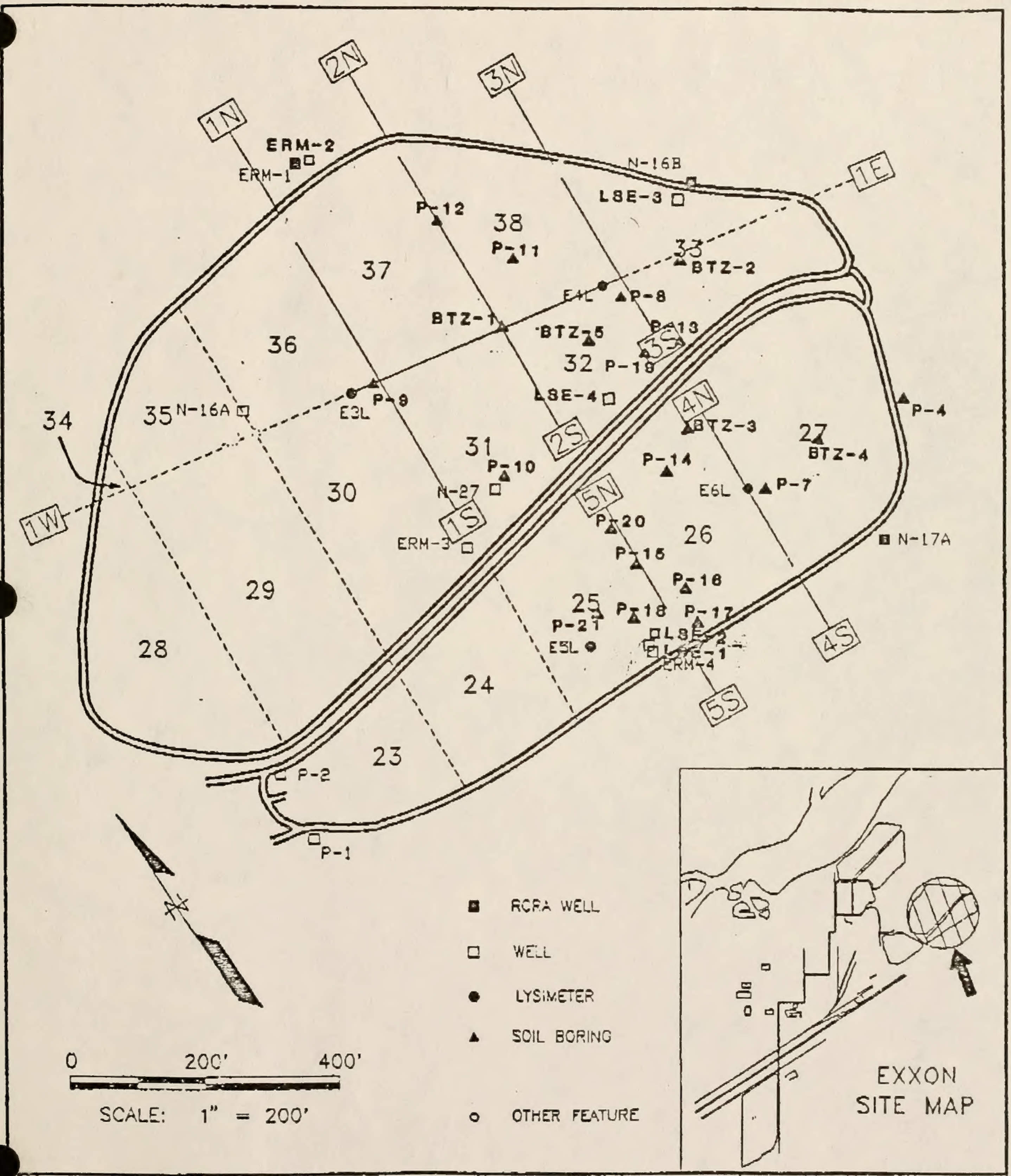


FIGURE 1

NEW EAST LANDFARM WELLS AND BORINGS